In [1]:
```
!pip install tensorflow-gpu==2.0.0
%matplotlib inline
```

```
Collecting tensorflow-gpu==2.0.0
  Downloading https://files.pythonhosted.org/packages/25/44/47f0722aea081697143fbcf5d2aa60d1aee4aaacb5869aee2
b568974777b/tensorflow_gpu-2.0.0-cp36-cp36m-manylinux2010_x86_64.whl (380.8MB)
     |████████████████████████████████| 380.8MB 41kB/s
Requirement already satisfied: numpy<2.0,>=1.16.0 in /usr/local/lib/python3.6/dist-packages (from tensorflow-
gpu==2.0.0) (1.18.4)
Requirement already satisfied: keras-preprocessing>=1.0.5 in /usr/local/lib/python3.6/dist-packages (from ten
sorflow-gpu==2.0.0) (1.1.0)
Collecting tensorboard<2.1.0,>=2.0.0
  Downloading https://files.pythonhosted.org/packages/76/54/99b9d5d52d5cb732f099baaaf7740403e83fe6b0cedde940f
abd2b13d75a/tensorboard-2.0.2-py3-none-any.whl (3.8MB)
     |████████████████████████████████| 3.8MB 38.8MB/s
Requirement already satisfied: wrapt>=1.11.1 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gpu==
2.0.0) (1.12.1)
Requirement already satisfied: astor>=0.6.0 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gpu==
2.0.0) (0.8.1)
Collecting gast==0.2.2
  Downloading https://files.pythonhosted.org/packages/4e/35/11749bf99b2d4e3cceb4d55ca22590b0d7c2c62b9de38ac4a
4a7f4687421/gast-0.2.2.tar.gz
Requirement already satisfied: wheel>=0.26 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gpu==2.
0.0) (0.34.2)
Collecting tensorflow-estimator<2.1.0,>=2.0.0
  Downloading https://files.pythonhosted.org/packages/fc/08/8b927337b7019c374719145d1dceba21a8bb909b93b1ad6f8
fb7d22c1ca1/tensorflow_estimator-2.0.1-py2.py3-none-any.whl (449kB)
     |████████████████████████████████| 450kB 36.7MB/s
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.6/dist-packages (from tensorflow-g
pu==2.0.0) (3.2.1)
Requirement already satisfied: google-pasta>=0.1.6 in /usr/local/lib/python3.6/dist-packages (from tensorflow
-gpu==2.0.0) (0.2.0)
Requirement already satisfied: absl-py>=0.7.0 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gpu=
=2.0.0) (0.9.0)
Requirement already satisfied: six>=1.10.0 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gpu==2.
0.0) (1.12.0)
Requirement already satisfied: keras-applications>=1.0.8 in /usr/local/lib/python3.6/dist-packages (from tens
orflow-gpu==2.0.0) (1.0.8)
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gp
u==2.0.0) (1.1.0)
Requirement already satisfied: protobuf>=3.6.1 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gpu
==2.0.0) (3.10.0)
Requirement already satisfied: grpcio>=1.8.6 in /usr/local/lib/python3.6/dist-packages (from tensorflow-gpu==
2.0.0) (1.28.1)
Requirement already satisfied: google-auth<2,>=1.6.3 in /usr/local/lib/python3.6/dist-packages (from tensorbo
ard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (1.7.2)
```

```
Requirement already satisfied: setuptools>=41.0.0 in /usr/local/lib/python3.6/dist-packages (from tensorboard
<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (46.1.3)
Requirement already satisfied: werkzeug>=0.11.15 in /usr/local/lib/python3.6/dist-packages (from tensorboard<
2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (1.0.1)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /usr/local/lib/python3.6/dist-packages (fr
om tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (0.4.1)
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.6/dist-packages (from tensorboar
d<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (2.23.0)
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.6/dist-packages (from tensorboard<2.
1.0,>=2.0.0->tensorflow-gpu==2.0.0) (3.2.1)
Requirement already satisfied: h5py in /usr/local/lib/python3.6/dist-packages (from keras-applications>=1.0.8
->tensorflow-gpu==2.0.0) (2.10.0)
Requirement already satisfied: cachetools<3.2,>=2.0.0 in /usr/local/lib/python3.6/dist-packages (from google-
auth<2,>=1.6.3->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (3.1.1)
Requirement already satisfied: rsa<4.1,>=3.1.4 in /usr/local/lib/python3.6/dist-packages (from google-auth<2,
>=1.6.3->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (4.0)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.6/dist-packages (from google-a
uth<2,>=1.6.3->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (0.2.8)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.6/dist-packages (from googl
e-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (1.3.0)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.6/dist-packages (from requests<3,>=2.2
1.0->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (2.9)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.6/dist-packages (from requests<3,
>=2.21.0->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (2020.4.5.1)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.6/dist-packa
ges (from requests<3,>=2.21.0->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (1.24.3)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.6/dist-packages (from requests<3,>
=2.21.0->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (3.0.4)
Requirement already satisfied: pyasn1>=0.1.3 in /usr/local/lib/python3.6/dist-packages (from rsa<4.1,>=3.1.4-
>google-auth<2,>=1.6.3->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (0.4.8)
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.6/dist-packages (from requests-oauth
lib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.1.0,>=2.0.0->tensorflow-gpu==2.0.0) (3.1.0)
Building wheels for collected packages: gast
  Building wheel for gast (setup.py) ... done
  Created wheel for gast: filename=gast-0.2.2-cp36-none-any.whl size=7540 sha256=de2dd7be5ef1628ef149157f211d
05f36b8c285ecfc7a743db87eaec2b4c8228
  Stored in directory: /root/.cache/pip/wheels/5c/2e/7e/a1d4d4fcebe6c381f378ce7743a3ced3699feb89bcfbdadadd
Successfully built gast
ERROR: tensorflow 2.2.0rc4 has requirement gast==0.3.3, but you'll have gast 0.2.2 which is incompatible.
ERROR: tensorflow 2.2.0rc4 has requirement tensorboard<2.3.0,>=2.2.0, but you'll have tensorboard 2.0.2 which
is incompatible.
ERROR: tensorflow 2.2.0rc4 has requirement tensorflow-estimator<2.3.0,>=2.2.0, but you'll have tensorflow-est
imator 2.0.1 which is incompatible.
```

```
ERROR: tensorflow-probability 0.10.0rc0 has requirement gast>=0.3.2, but you'll have gast 0.2.2 which is inco
mpatible.
Installing collected packages: tensorboard, gast, tensorflow-estimator, tensorflow-gpu
  Found existing installation: tensorboard 2.2.1
    Uninstalling tensorboard-2.2.1:
      Successfully uninstalled tensorboard-2.2.1
  Found existing installation: gast 0.3.3
    Uninstalling gast-0.3.3:
      Successfully uninstalled gast-0.3.3
  Found existing installation: tensorflow-estimator 2.2.0
    Uninstalling tensorflow-estimator-2.2.0:
      Successfully uninstalled tensorflow-estimator-2.2.0
Successfully installed gast-0.2.2 tensorboard-2.0.2 tensorflow-estimator-2.0.1 tensorflow-gpu-2.0.0
```

In [2]:

```
import pickle

import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt


tf.__version__
tf.test.gpu_device_name()
```

Out[2]:

```
'/device:GPU:0'
```

In [ ]:

In [ ]:

In [ ]:
```
# It is GNU radio generated datset which accounts for practical aspect of wieless channels such as ...
# It 220,000 samples. Each sample is 2*128 matrix containing the IQ (2) of a received signal sampled 128 time
s.
# It contains sample points for 11 diifferent modulation schemes (BPSK,QAM,8PSK,...) at 20 different SNR leve
ls, which adds up to 220 tuples of ('modulation',SNR) where for each tuple we have 1000 samples of dimenssion
2*128.

def to_onehot(yin):
    yy = list(yin) # This is a workaround as the map output for python3 is not a list
    yy1 = np.zeros([len(list(yy)), max(yy)+1])
    yy1[np.arange(len(list(yy))),yy] = 1
    return yy1


def ModCls_loaddata(path_to_dataset):
    # There is a Pickle incompatibility of numpy arrays between Python 2 and 3
    # which generates ascii encoding error, to work around that we use the following instead of
    # Xd = cPickle.load(open("RML2016.10a_dict.dat",'rb'))
    with open(path_to_dataset, 'rb') as open_file:
        u = pickle._Unpickler( open_file )
        u.encoding = 'latin1'
        Xd = u.load()

    snrs,mods = map(lambda j: sorted(list(set(map(lambda x: x[j], Xd.keys())))), [1,0])
    X = []
    lbl = []
    for mod in mods:
        for snr in snrs:
            X.append(Xd[(mod,snr)])
            for i in range(Xd[(mod,snr)].shape[0]):  lbl.append((mod,snr))
    X = np.vstack(X)

    # Partition the data
    #  into training and test sets of the form we can train/test on
    #  while keeping SNR and Mod labels handy for each
    np.random.seed(2016)
    n_examples = X.shape[0]
    n_train = int(n_examples * 0.5)
    train_idx = np.random.choice(range(0,n_examples), size=n_train, replace=False)
    test_idx = list(set(range(0,n_examples))-set(train_idx))
    X_train = X[train_idx]
    X_test =  X[test_idx]
```

```
    Y_train = to_onehot(map(lambda x: mods.index(lbl[x][0]), train_idx))
    Y_test = to_onehot(map(lambda x: mods.index(lbl[x][0]), test_idx))

    in_shp = list(X_train.shape[1:])
    classes = mods
    return X,lbl,X_train,X_test,classes,snrs,mods,Y_train,Y_test,train_idx,test_idx
```

In [4]:
```
from google.colab import drive
drive.mount('/gdrive')
%cd /gdrive
```

```
Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6qk8qdgf4n4g
3pfee6491hc0brc4i.apps.googleusercontent.com&redirect_uri=urn%3aietf%3awg%3aoauth%3a2.0%3aoob&response_type=c
ode&scope=email%20https%3a%2f%2fwww.googleapis.com%2fauth%2fdocs.test%20https%3a%2f%2fwww.googleapis.com%2fau
th%2fdrive%20https%3a%2f%2fwww.googleapis.com%2fauth%2fdrive.photos.readonly%20https%3a%2f%2fwww.googleapis.c
om%2fauth%2fpeopleapi.readonly

Enter your authorization code:
··********··
Mounted at /gdrive
/gdrive
```

In [5]:
```
!ls 'My Drive/Colab Notebooks/Notebooks/'
```

```
 215_FP_2.ipynb     'Mini-project 3'      Untitled0.ipynb   Untitled5.ipynb
'homework=1.ipynb'   model.h5             Untitled1.ipynb   Untitled6.ipynb
 homework-1.ipynb    MOD.pkl              Untitled2.ipynb
 hw1-275-.ipynb      Pre-training.ipynb   Untitled3.ipynb
 LICENSE.TXT         Untitled             Untitled4.ipynb
```

In [6]:
```
X,lbl,X_train,X_test,classes,snrs,mods,Y_train,Y_test,train_idx,test_idx = ModCls_loaddata(
    'My Drive/Colab Notebooks/Notebooks/MOD.pkl')


print('X_train.shape:', X_train.shape)
print('Y_train.shape:', Y_train.shape)
print(X.shape)
print(len(lbl))



print('Y_train[4:9]: \n', Y_train[4:9])
print('train_idx.shape:', train_idx.shape)
print('train_idx[4:9]:', train_idx[4:9])
print(lbl[train_idx[4]], lbl[train_idx[5]], lbl[train_idx[6]], lbl[train_idx[7]], lbl[train_idx[8]], lbl[trai
n_idx[9]])

print('classes:', classes)
```

```
X_train.shape: (110000, 2, 128)
Y_train.shape: (110000, 11)
(220000, 2, 128)
220000
Y_train[4:9]:
 [[0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0.]]
train_idx.shape: (110000,)
train_idx[4:9]: [184829 192624 169402 179790 145554]
('QPSK', -12) ('QPSK', 4) ('QAM64', -2) ('QAM64', 18) ('QAM16', -10) ('BPSK', -2)
classes: ['8PSK', 'AM-DSB', 'AM-SSB', 'BPSK', 'CPFSK', 'GFSK', 'PAM4', 'QAM16', 'QAM64', 'QPSK', 'WBFM']
```

In [7]:
```
X_train[1].shape
```

Out[7]:
```
(2, 128)
```

In [ ]:

In [ ]:

In [8]:
```
# The CNN Network
list(X_train.shape[1:])

in_shp = list(X_train.shape[1:])
dr = 0.5 # dropout rate (%)
#==============================================================================
# Build VT-CNN2 Neural Net model using Keras
#  - Reshape [N,2,128] to [N,1,2,128] on input
#  - Pass through 2 2DConv/ReLu layers
#  - Pass through 2 Dense layers (ReLu and Softmax)
#  - Perform categorical cross entropy optimization

model = tf.keras.models.Sequential()
model.add(tf.keras.layers.Reshape([1]+in_shp, input_shape=in_shp))
model.add(tf.keras.layers.ZeroPadding2D((0,2),data_format='channels_first'))
model.add(tf.keras.layers.Convolution2D(256,(1,3), padding='valid', activation="relu", name="conv1",data_form
at='channels_first', kernel_initializer='glorot_uniform'))
model.add(tf.keras.layers.Dropout(dr))
model.add(tf.keras.layers.ZeroPadding2D((0,2),data_format='channels_first'))
model.add(tf.keras.layers.Convolution2D(80,(2,3), padding="valid", activation="relu", name="conv2", data_form
at='channels_first', kernel_initializer='glorot_uniform'))
model.add(tf.keras.layers.Dropout(dr))
model.add(tf.keras.layers.Flatten())
model.add(tf.keras.layers.Dense(256, activation='relu', kernel_initializer='he_normal', name="dense1"))
model.add(tf.keras.layers.Dropout(dr))
model.add(tf.keras.layers.Dense(len(classes), kernel_initializer='he_normal', name="dense2" ))
model.add(tf.keras.layers.Activation('softmax'))
model.add(tf.keras.layers.Reshape([len(classes)]))
model.compile(loss='categorical_crossentropy', optimizer='adam',metrics=['accuracy'])
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
reshape (Reshape)            (None, 1, 2, 128)         0
_________________________________________________________________
zero_padding2d (ZeroPadding2 (None, 1, 2, 132)         0
_________________________________________________________________
conv1 (Conv2D)               (None, 256, 2, 130)       1024
_________________________________________________________________
dropout (Dropout)            (None, 256, 2, 130)       0
_________________________________________________________________
zero_padding2d_1 (ZeroPaddin (None, 256, 2, 134)       0
_________________________________________________________________
conv2 (Conv2D)               (None, 80, 1, 132)        122960
_________________________________________________________________
dropout_1 (Dropout)          (None, 80, 1, 132)        0
_________________________________________________________________
flatten (Flatten)            (None, 10560)             0
_________________________________________________________________
dense1 (Dense)               (None, 256)               2703616
_________________________________________________________________
dropout_2 (Dropout)          (None, 256)               0
_________________________________________________________________
dense2 (Dense)               (None, 11)                2827
_________________________________________________________________
activation (Activation)      (None, 11)                0
_________________________________________________________________
reshape_1 (Reshape)          (None, 11)                0
=================================================================
Total params: 2,830,427
Trainable params: 2,830,427
Non-trainable params: 0
_________________________________________________________________
```

In [12]:
```
nb_epoch = 100     # number of epochs to train on
batch_size = 1024  # training batch size
filepath = "My Drive/Colab Notebooks/model2.h5"
callbacks = [
    tf.keras.callbacks.ModelCheckpoint(filepath, monitor='val_loss', verbose=0, save_best_only=True, mode='au
to'),
    tf.keras.callbacks.EarlyStopping(monitor='val_loss', patience=100, verbose=0, mode='auto')
]
# perform training ...
history = model.fit(X_train,Y_train,batch_size=batch_size,epochs=nb_epoch,verbose=2,validation_data=(X_test,
Y_test),callbacks = callbacks)
model.load_weights(filepath)
```

```
Train on 110000 samples, validate on 110000 samples
Epoch 1/100
110000/110000 - 7s - loss: 1.3367 - accuracy: 0.4833 - val_loss: 1.2879 - val_accuracy: 0.5016
Epoch 2/100
110000/110000 - 7s - loss: 1.3392 - accuracy: 0.4823 - val_loss: 1.2931 - val_accuracy: 0.4936
Epoch 3/100
110000/110000 - 7s - loss: 1.3313 - accuracy: 0.4845 - val_loss: 1.2819 - val_accuracy: 0.5033
Epoch 4/100
110000/110000 - 7s - loss: 1.3270 - accuracy: 0.4860 - val_loss: 1.2849 - val_accuracy: 0.5040
Epoch 5/100
110000/110000 - 8s - loss: 1.3263 - accuracy: 0.4879 - val_loss: 1.2795 - val_accuracy: 0.5048
Epoch 6/100
110000/110000 - 7s - loss: 1.3237 - accuracy: 0.4880 - val_loss: 1.2783 - val_accuracy: 0.5023
Epoch 7/100
110000/110000 - 7s - loss: 1.3239 - accuracy: 0.4873 - val_loss: 1.2822 - val_accuracy: 0.5039
Epoch 8/100
110000/110000 - 7s - loss: 1.3198 - accuracy: 0.4881 - val_loss: 1.2980 - val_accuracy: 0.4957
Epoch 9/100
110000/110000 - 7s - loss: 1.3141 - accuracy: 0.4911 - val_loss: 1.2894 - val_accuracy: 0.5023
Epoch 10/100
110000/110000 - 8s - loss: 1.3155 - accuracy: 0.4922 - val_loss: 1.2772 - val_accuracy: 0.5054
Epoch 11/100
110000/110000 - 7s - loss: 1.3117 - accuracy: 0.4919 - val_loss: 1.2855 - val_accuracy: 0.4984
Epoch 12/100
110000/110000 - 7s - loss: 1.3085 - accuracy: 0.4916 - val_loss: 1.2846 - val_accuracy: 0.5030
Epoch 13/100
110000/110000 - 8s - loss: 1.3097 - accuracy: 0.4941 - val_loss: 1.2750 - val_accuracy: 0.5031
Epoch 14/100
110000/110000 - 7s - loss: 1.3124 - accuracy: 0.4933 - val_loss: 1.2740 - val_accuracy: 0.5030
Epoch 15/100
110000/110000 - 7s - loss: 1.2967 - accuracy: 0.4967 - val_loss: 1.2775 - val_accuracy: 0.5027
Epoch 16/100
110000/110000 - 7s - loss: 1.2985 - accuracy: 0.4975 - val_loss: 1.2953 - val_accuracy: 0.4963
Epoch 17/100
110000/110000 - 7s - loss: 1.2990 - accuracy: 0.4981 - val_loss: 1.2744 - val_accuracy: 0.5015
Epoch 18/100
110000/110000 - 7s - loss: 1.2952 - accuracy: 0.4975 - val_loss: 1.2908 - val_accuracy: 0.4985
Epoch 19/100
110000/110000 - 7s - loss: 1.2968 - accuracy: 0.4985 - val_loss: 1.2886 - val_accuracy: 0.5020
Epoch 20/100
110000/110000 - 7s - loss: 1.2883 - accuracy: 0.5029 - val_loss: 1.2803 - val_accuracy: 0.5050
Epoch 21/100
110000/110000 - 7s - loss: 1.2869 - accuracy: 0.5010 - val_loss: 1.2816 - val_accuracy: 0.5043
```

```
Epoch 22/100
110000/110000 - 8s - loss: 1.2880 - accuracy: 0.5006 - val_loss: 1.2715 - val_accuracy: 0.5086
Epoch 23/100
110000/110000 - 7s - loss: 1.2871 - accuracy: 0.5016 - val_loss: 1.2881 - val_accuracy: 0.5018
Epoch 24/100
110000/110000 - 7s - loss: 1.2829 - accuracy: 0.5014 - val_loss: 1.2702 - val_accuracy: 0.5070
Epoch 25/100
110000/110000 - 7s - loss: 1.2808 - accuracy: 0.5035 - val_loss: 1.2769 - val_accuracy: 0.5071
Epoch 26/100
110000/110000 - 7s - loss: 1.2786 - accuracy: 0.5059 - val_loss: 1.2770 - val_accuracy: 0.5045
Epoch 27/100
110000/110000 - 7s - loss: 1.2755 - accuracy: 0.5059 - val_loss: 1.2722 - val_accuracy: 0.5059
Epoch 28/100
110000/110000 - 7s - loss: 1.2725 - accuracy: 0.5047 - val_loss: 1.2751 - val_accuracy: 0.5054
Epoch 29/100
110000/110000 - 8s - loss: 1.2723 - accuracy: 0.5060 - val_loss: 1.2692 - val_accuracy: 0.5079
Epoch 30/100
110000/110000 - 7s - loss: 1.2684 - accuracy: 0.5084 - val_loss: 1.2737 - val_accuracy: 0.5062
Epoch 31/100
110000/110000 - 7s - loss: 1.2661 - accuracy: 0.5074 - val_loss: 1.2714 - val_accuracy: 0.5088
Epoch 32/100
110000/110000 - 7s - loss: 1.2653 - accuracy: 0.5076 - val_loss: 1.2723 - val_accuracy: 0.5008
Epoch 33/100
110000/110000 - 8s - loss: 1.2645 - accuracy: 0.5102 - val_loss: 1.2684 - val_accuracy: 0.5086
Epoch 34/100
110000/110000 - 7s - loss: 1.2565 - accuracy: 0.5131 - val_loss: 1.2806 - val_accuracy: 0.5037
Epoch 35/100
110000/110000 - 7s - loss: 1.2565 - accuracy: 0.5117 - val_loss: 1.2704 - val_accuracy: 0.5020
Epoch 36/100
110000/110000 - 8s - loss: 1.2574 - accuracy: 0.5129 - val_loss: 1.2649 - val_accuracy: 0.5113
Epoch 37/100
110000/110000 - 7s - loss: 1.2486 - accuracy: 0.5163 - val_loss: 1.2651 - val_accuracy: 0.5095
Epoch 38/100
110000/110000 - 7s - loss: 1.2493 - accuracy: 0.5135 - val_loss: 1.2689 - val_accuracy: 0.5094
Epoch 39/100
110000/110000 - 8s - loss: 1.2465 - accuracy: 0.5159 - val_loss: 1.2609 - val_accuracy: 0.5132
Epoch 40/100
110000/110000 - 7s - loss: 1.2465 - accuracy: 0.5151 - val_loss: 1.2720 - val_accuracy: 0.5134
Epoch 41/100
110000/110000 - 7s - loss: 1.2401 - accuracy: 0.5190 - val_loss: 1.2609 - val_accuracy: 0.5145
Epoch 42/100
110000/110000 - 7s - loss: 1.2366 - accuracy: 0.5196 - val_loss: 1.2739 - val_accuracy: 0.5047
Epoch 43/100
```

```
110000/110000 - 7s - loss: 1.2395 - accuracy: 0.5193 - val_loss: 1.2802 - val_accuracy: 0.5114
Epoch 44/100
110000/110000 - 8s - loss: 1.2358 - accuracy: 0.5214 - val_loss: 1.2575 - val_accuracy: 0.5143
Epoch 45/100
110000/110000 - 7s - loss: 1.2309 - accuracy: 0.5235 - val_loss: 1.2568 - val_accuracy: 0.5210
Epoch 46/100
110000/110000 - 7s - loss: 1.2293 - accuracy: 0.5237 - val_loss: 1.2569 - val_accuracy: 0.5221
Epoch 47/100
110000/110000 - 7s - loss: 1.2272 - accuracy: 0.5247 - val_loss: 1.2573 - val_accuracy: 0.5222
Epoch 48/100
110000/110000 - 8s - loss: 1.2203 - accuracy: 0.5257 - val_loss: 1.2523 - val_accuracy: 0.5257
Epoch 49/100
110000/110000 - 7s - loss: 1.2152 - accuracy: 0.5292 - val_loss: 1.2581 - val_accuracy: 0.5229
Epoch 50/100
110000/110000 - 7s - loss: 1.2173 - accuracy: 0.5293 - val_loss: 1.2569 - val_accuracy: 0.5210
Epoch 51/100
110000/110000 - 7s - loss: 1.2164 - accuracy: 0.5301 - val_loss: 1.2563 - val_accuracy: 0.5220
Epoch 52/100
110000/110000 - 8s - loss: 1.2135 - accuracy: 0.5298 - val_loss: 1.2506 - val_accuracy: 0.5228
Epoch 53/100
110000/110000 - 7s - loss: 1.2114 - accuracy: 0.5295 - val_loss: 1.2538 - val_accuracy: 0.5212
Epoch 54/100
110000/110000 - 7s - loss: 1.2120 - accuracy: 0.5298 - val_loss: 1.2539 - val_accuracy: 0.5208
Epoch 55/100
110000/110000 - 7s - loss: 1.2115 - accuracy: 0.5327 - val_loss: 1.2513 - val_accuracy: 0.5254
Epoch 56/100
110000/110000 - 7s - loss: 1.2070 - accuracy: 0.5317 - val_loss: 1.2541 - val_accuracy: 0.5209
Epoch 57/100
110000/110000 - 7s - loss: 1.2039 - accuracy: 0.5328 - val_loss: 1.2540 - val_accuracy: 0.5213
Epoch 58/100
110000/110000 - 8s - loss: 1.2054 - accuracy: 0.5346 - val_loss: 1.2500 - val_accuracy: 0.5248
Epoch 59/100
110000/110000 - 7s - loss: 1.1995 - accuracy: 0.5356 - val_loss: 1.2507 - val_accuracy: 0.5231
Epoch 60/100
110000/110000 - 8s - loss: 1.1956 - accuracy: 0.5374 - val_loss: 1.2491 - val_accuracy: 0.5210
Epoch 61/100
110000/110000 - 7s - loss: 1.1958 - accuracy: 0.5369 - val_loss: 1.2512 - val_accuracy: 0.5247
Epoch 62/100
110000/110000 - 7s - loss: 1.1932 - accuracy: 0.5389 - val_loss: 1.2531 - val_accuracy: 0.5272
Epoch 63/100
110000/110000 - 8s - loss: 1.1924 - accuracy: 0.5373 - val_loss: 1.2485 - val_accuracy: 0.5229
Epoch 64/100
110000/110000 - 7s - loss: 1.1902 - accuracy: 0.5398 - val_loss: 1.2557 - val_accuracy: 0.5206
```

```
Epoch 65/100
110000/110000 - 7s - loss: 1.1883 - accuracy: 0.5396 - val_loss: 1.2578 - val_accuracy: 0.5241
Epoch 66/100
110000/110000 - 7s - loss: 1.1860 - accuracy: 0.5424 - val_loss: 1.2540 - val_accuracy: 0.5238
Epoch 67/100
110000/110000 - 8s - loss: 1.1812 - accuracy: 0.5424 - val_loss: 1.2477 - val_accuracy: 0.5242
Epoch 68/100
110000/110000 - 7s - loss: 1.1833 - accuracy: 0.5423 - val_loss: 1.2540 - val_accuracy: 0.5248
Epoch 69/100
110000/110000 - 7s - loss: 1.1803 - accuracy: 0.5427 - val_loss: 1.2487 - val_accuracy: 0.5257
Epoch 70/100
110000/110000 - 8s - loss: 1.1778 - accuracy: 0.5440 - val_loss: 1.2452 - val_accuracy: 0.5272
Epoch 71/100
110000/110000 - 7s - loss: 1.1747 - accuracy: 0.5457 - val_loss: 1.2471 - val_accuracy: 0.5234
Epoch 72/100
110000/110000 - 7s - loss: 1.1752 - accuracy: 0.5440 - val_loss: 1.2661 - val_accuracy: 0.5224
Epoch 73/100
110000/110000 - 7s - loss: 1.1693 - accuracy: 0.5460 - val_loss: 1.2536 - val_accuracy: 0.5236
Epoch 74/100
110000/110000 - 7s - loss: 1.1709 - accuracy: 0.5488 - val_loss: 1.2493 - val_accuracy: 0.5250
Epoch 75/100
110000/110000 - 7s - loss: 1.1716 - accuracy: 0.5466 - val_loss: 1.2503 - val_accuracy: 0.5231
Epoch 76/100
110000/110000 - 7s - loss: 1.1644 - accuracy: 0.5498 - val_loss: 1.2604 - val_accuracy: 0.5246
Epoch 77/100
110000/110000 - 7s - loss: 1.1677 - accuracy: 0.5491 - val_loss: 1.2601 - val_accuracy: 0.5207
Epoch 78/100
110000/110000 - 7s - loss: 1.1621 - accuracy: 0.5507 - val_loss: 1.2559 - val_accuracy: 0.5255
Epoch 79/100
110000/110000 - 7s - loss: 1.1661 - accuracy: 0.5498 - val_loss: 1.2520 - val_accuracy: 0.5234
Epoch 80/100
110000/110000 - 7s - loss: 1.1572 - accuracy: 0.5506 - val_loss: 1.2551 - val_accuracy: 0.5253
Epoch 81/100
110000/110000 - 7s - loss: 1.1577 - accuracy: 0.5519 - val_loss: 1.2523 - val_accuracy: 0.5250
Epoch 82/100
110000/110000 - 7s - loss: 1.1535 - accuracy: 0.5539 - val_loss: 1.2496 - val_accuracy: 0.5279
Epoch 83/100
110000/110000 - 7s - loss: 1.1594 - accuracy: 0.5523 - val_loss: 1.2559 - val_accuracy: 0.5245
Epoch 84/100
110000/110000 - 7s - loss: 1.1513 - accuracy: 0.5557 - val_loss: 1.2523 - val_accuracy: 0.5260
Epoch 85/100
110000/110000 - 7s - loss: 1.1519 - accuracy: 0.5552 - val_loss: 1.2488 - val_accuracy: 0.5275
Epoch 86/100
```

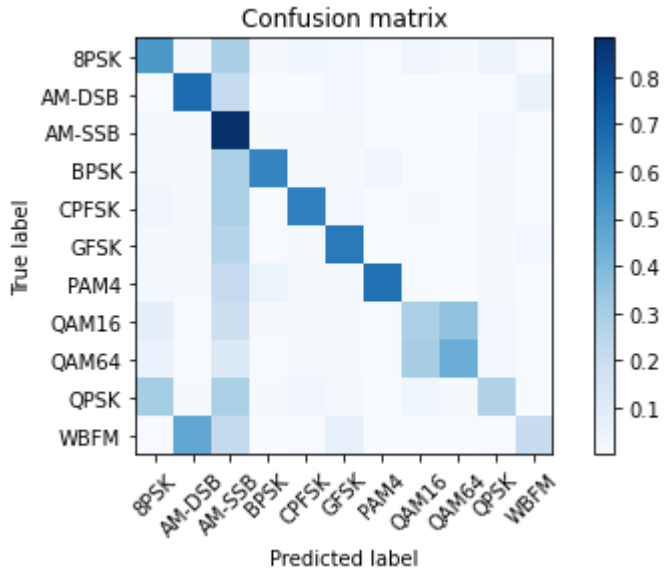
```
110000/110000 - 7s - loss: 1.1480 - accuracy: 0.5580 - val_loss: 1.2602 - val_accuracy: 0.5217
Epoch 87/100
110000/110000 - 7s - loss: 1.1495 - accuracy: 0.5570 - val_loss: 1.2559 - val_accuracy: 0.5265
Epoch 88/100
110000/110000 - 7s - loss: 1.1516 - accuracy: 0.5549 - val_loss: 1.2588 - val_accuracy: 0.5259
Epoch 89/100
110000/110000 - 7s - loss: 1.1437 - accuracy: 0.5564 - val_loss: 1.2543 - val_accuracy: 0.5251
Epoch 90/100
110000/110000 - 7s - loss: 1.1435 - accuracy: 0.5588 - val_loss: 1.2594 - val_accuracy: 0.5216
Epoch 91/100
110000/110000 - 7s - loss: 1.1391 - accuracy: 0.5599 - val_loss: 1.2516 - val_accuracy: 0.5243
Epoch 92/100
110000/110000 - 7s - loss: 1.1388 - accuracy: 0.5600 - val_loss: 1.2551 - val_accuracy: 0.5260
Epoch 93/100
110000/110000 - 7s - loss: 1.1365 - accuracy: 0.5630 - val_loss: 1.2568 - val_accuracy: 0.5235
Epoch 94/100
110000/110000 - 7s - loss: 1.1366 - accuracy: 0.5608 - val_loss: 1.2545 - val_accuracy: 0.5229
Epoch 95/100
110000/110000 - 7s - loss: 1.1358 - accuracy: 0.5623 - val_loss: 1.2577 - val_accuracy: 0.5248
Epoch 96/100
110000/110000 - 7s - loss: 1.1366 - accuracy: 0.5611 - val_loss: 1.2539 - val_accuracy: 0.5255
Epoch 97/100
110000/110000 - 7s - loss: 1.1347 - accuracy: 0.5618 - val_loss: 1.2553 - val_accuracy: 0.5241
Epoch 98/100
110000/110000 - 7s - loss: 1.1326 - accuracy: 0.5629 - val_loss: 1.2819 - val_accuracy: 0.5190
Epoch 99/100
110000/110000 - 7s - loss: 1.1315 - accuracy: 0.5620 - val_loss: 1.2572 - val_accuracy: 0.5198
Epoch 100/100
110000/110000 - 7s - loss: 1.1253 - accuracy: 0.5649 - val_loss: 1.2709 - val_accuracy: 0.5203
```

In [13]:
```
score = model.evaluate(X_test, Y_test, verbose=1, batch_size=batch_size)
print(score)
```

```
IOPub data rate exceeded.
The notebook server will temporarily stop sending output
to the client in order to avoid crashing it.
To change this limit, set the config variable
`--NotebookApp.iopub_data_rate_limit`.

Current values:
NotebookApp.iopub_data_rate_limit=1000000.0 (bytes/sec)
NotebookApp.rate_limit_window=3.0 (secs)


[1.2451983429128473, 0.52721816]
```

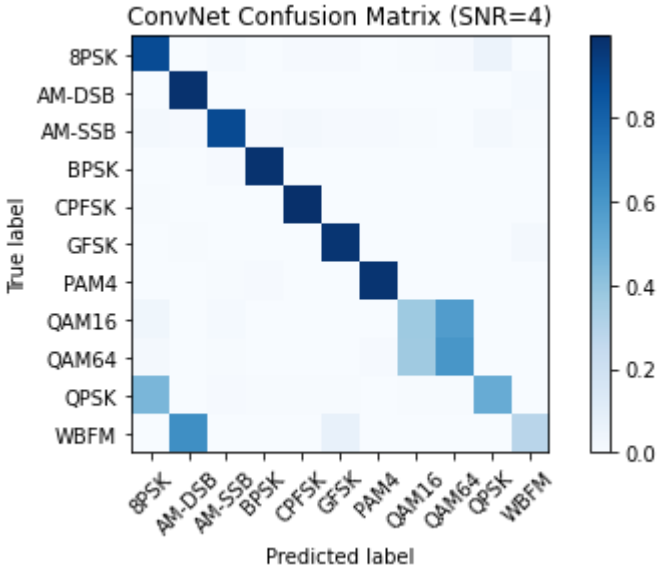
In [ ]:
```
def plot_confusion_matrix(cm, title='Confusion matrix', cmap=plt.cm.Blues, labels=[]):
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()
    tick_marks = np.arange(len(labels))
    plt.xticks(tick_marks, labels, rotation=45)
    plt.yticks(tick_marks, labels)
    plt.tight_layout()
    plt.ylabel('True label')
    plt.xlabel('Predicted label')
```

In [15]:
```
test_Y_hat = model.predict(X_test, batch_size=batch_size)
conf = np.zeros([len(classes),len(classes)])
confnorm = np.zeros([len(classes),len(classes)])
for i in range(0,X_test.shape[0]):
    j = list(Y_test[i,:]).index(1)
    k = int(np.argmax(test_Y_hat[i,:]))
    conf[j,k] = conf[j,k] + 1
for i in range(0,len(classes)):
    confnorm[i,:] = conf[i,:] / np.sum(conf[i,:])
plot_confusion_matrix(confnorm, labels=classes)
```



In [16]:
```
# Plot confusion matrix
acc = {}
for snr in snrs:

    # extract classes @ SNR
    test_SNRs = list(map(lambda x: lbl[x][1], test_idx))
    test_X_i = X_test[np.where(np.array(test_SNRs)==snr)]
    test_Y_i = Y_test[np.where(np.array(test_SNRs)==snr)]

    # estimate classes
    test_Y_i_hat = model.predict(test_X_i)
    conf = np.zeros([len(classes),len(classes)])
    confnorm = np.zeros([len(classes),len(classes)])
    for i in range(0,test_X_i.shape[0]):
        j = list(test_Y_i[i,:]).index(1)
        k = int(np.argmax(test_Y_i_hat[i,:]))
        conf[j,k] = conf[j,k] + 1
    for i in range(0,len(classes)):
        confnorm[i,:] = conf[i,:] / np.sum(conf[i,:])

    if snr==4:
      plt.figure()
      plot_confusion_matrix(confnorm, labels=classes, title="ConvNet Confusion Matrix (SNR=%d)"%(snr))

    cor = np.sum(np.diag(conf))
    ncor = np.sum(conf) - cor
    print("Overall Accuracy: ", cor / (cor+ncor))
    acc[snr] = 1.0*cor/(cor+ncor)
```

```
Overall Accuracy:  0.09643183897529735
Overall Accuracy:  0.088283378746594
Overall Accuracy:  0.09605643994211288
Overall Accuracy:  0.10952724648141465
Overall Accuracy:  0.13290793072014584
Overall Accuracy:  0.2084592145015106
Overall Accuracy:  0.34319309204482823
Overall Accuracy:  0.48588709677419356
Overall Accuracy:  0.610536044362292
Overall Accuracy:  0.6812409288824384
Overall Accuracy:  0.7481751824817519
Overall Accuracy:  0.7548164303889495
Overall Accuracy:  0.7714757709251101
Overall Accuracy:  0.7720216606498195
Overall Accuracy:  0.7808836789900812
Overall Accuracy:  0.7812386156648452
Overall Accuracy:  0.764077494115517
Overall Accuracy:  0.7798486805683705
Overall Accuracy:  0.7679638009049774
Overall Accuracy:  0.7782178217821782
```

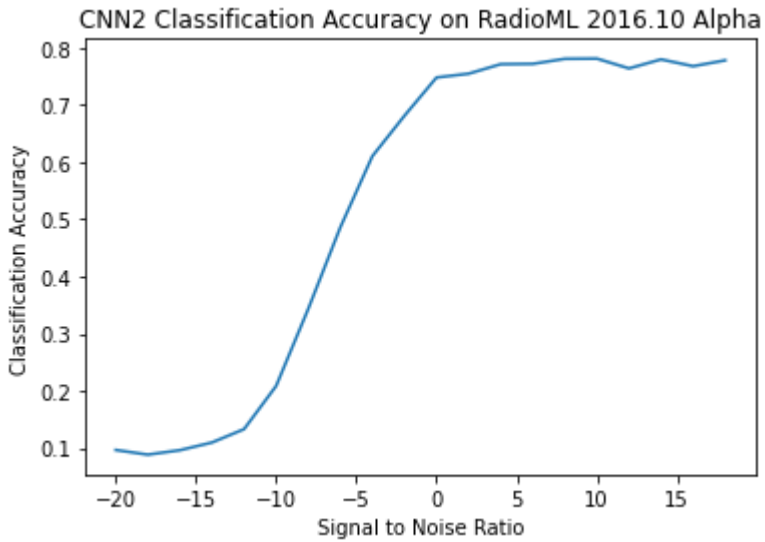


In [18]:
```
# Show loss curves
plt.figure()
plt.title('Training performance')
plt.plot(history.epoch, history.history['loss'], label='train loss+error')
plt.plot(history.epoch, history.history['val_loss'], label='val_error')
plt.legend()
```

Out[18]: <matplotlib.legend.Legend at 0x7f5b7a3cdc18>

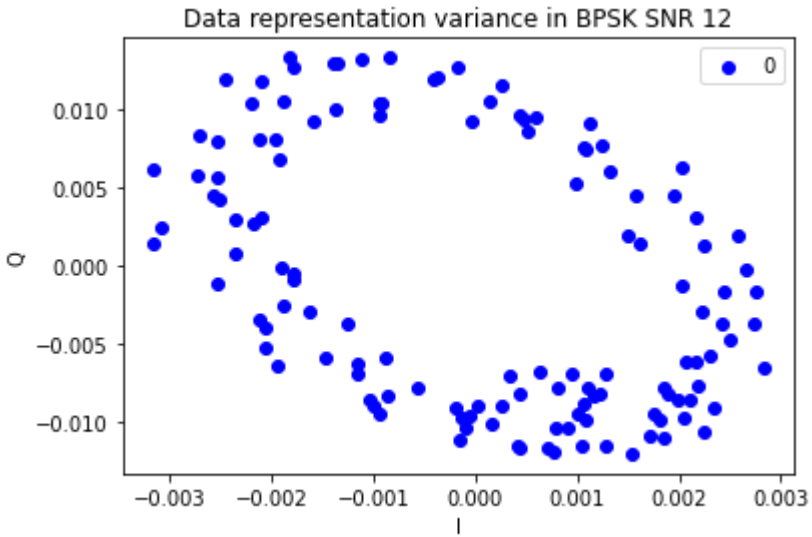
In [19]:
```
# Plot accuracy curve
plt.plot(snrs, list(map(lambda x: acc[x], snrs)))
plt.xlabel("Signal to Noise Ratio")
plt.ylabel("Classification Accuracy")
plt.title("CNN2 Classification Accuracy on RadioML 2016.10 Alpha")
```

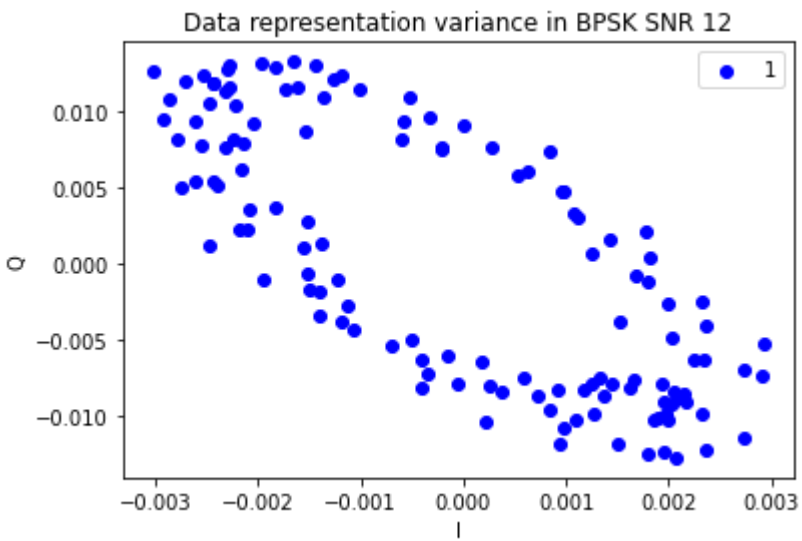
Out[19]: Text(0.5, 1.0, 'CNN2 Classification Accuracy on RadioML 2016.10 Alpha')

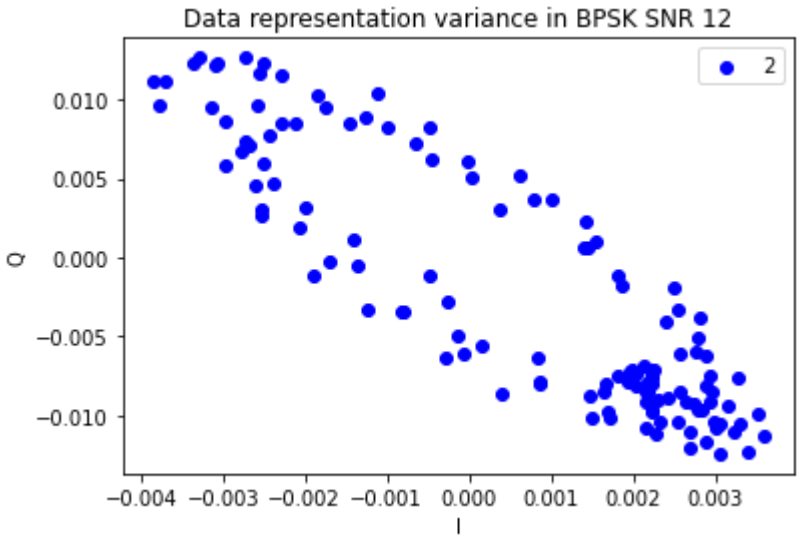


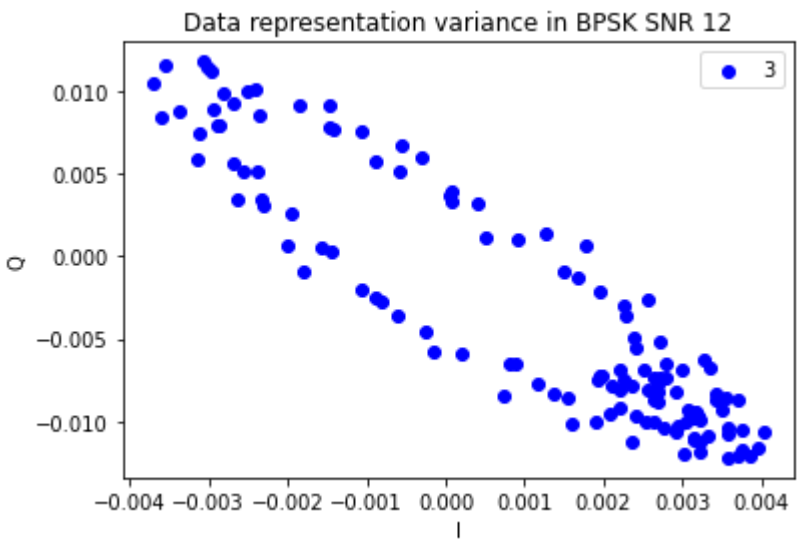
In [21]:
```
import pickle
import random, sys, keras
import pandas as pd
import numpy as np

with open('My Drive/Colab Notebooks/Notebooks/MOD.pkl', 'rb') as open_file:
        u = pickle._Unpickler( open_file )
        u.encoding = 'latin1'
        Xd = u.load()
snrs,mods = map(lambda j: sorted(list(set(map(lambda x: x[j], Xd.keys())))), [1,0])
X = []
Y=[]
lbl = []
for mod in mods:
  for snr in snrs:
    if(mod=='BPSK'and snr==12):
      test = Xd[(mod,snr)]
      #print(test)
      X.append(Xd[(mod,snr)])
      for i in range(Xd[(mod,snr)].shape[0]):
        lbl.append((mod,snr))
        Y.append([test[0]+1j*test[1]])
X = np.vstack(X)
Y= np.vstack(Y)

df= pd.DataFrame(lbl,columns=["mod","snr"])
df['snr'].value_counts()
ind = []
for i in range(0,df.shape[0]):
  if(df['snr'][i]==16):
    ind.append(i)

import matplotlib.pyplot as plt
for i in range(0,1000,1):
    x = X[i][0]
    y= X[i][1]
    fig = plt.figure()
    plt.scatter(x,y,c='blue',label=i)
    plt.xlabel("I")
    plt.ylabel("Q")
    plt.title("Data representation variance in BPSK SNR 12")
    plt.legend()
```

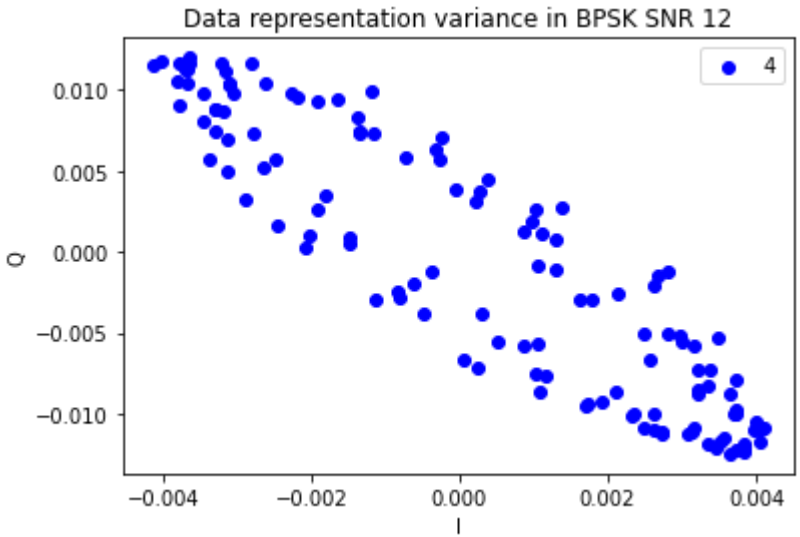
```
    plt.show()
#fig.savefig(path+"/IQ trained images/snr/%d.png"  % i)
```

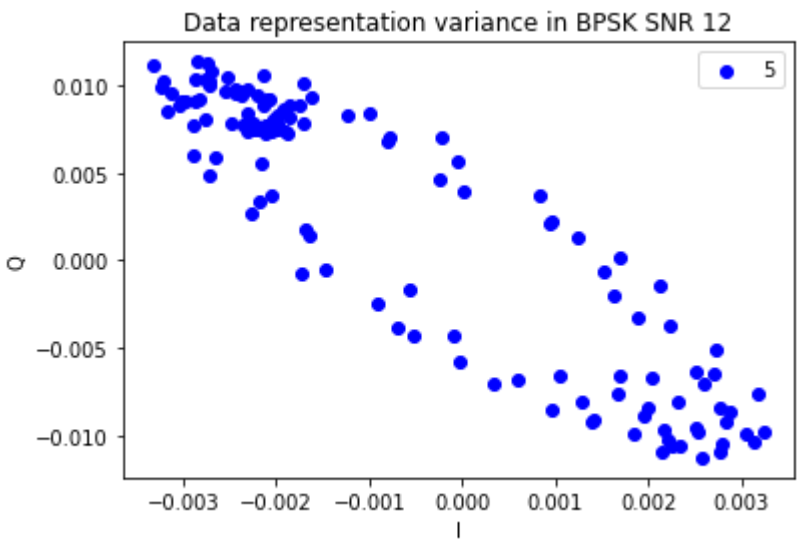

Data representation variance in BPSK SNR 12
0
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

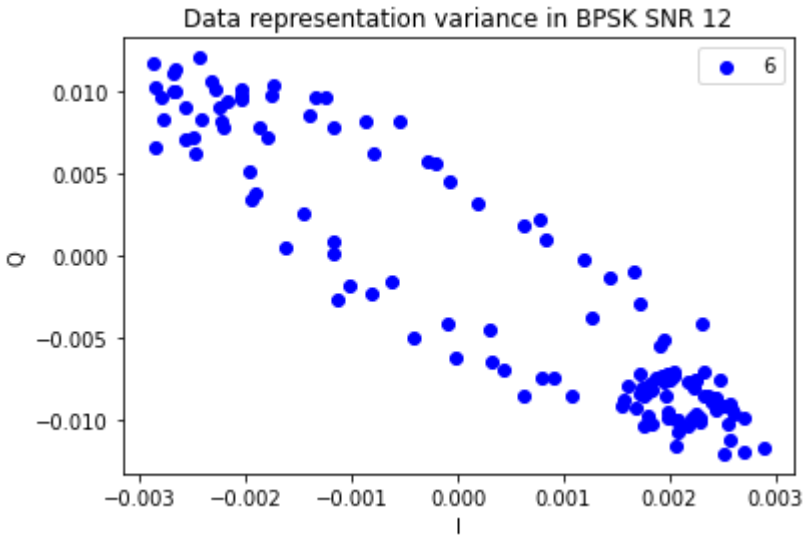

Data representation variance in BPSK SNR 12
1
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

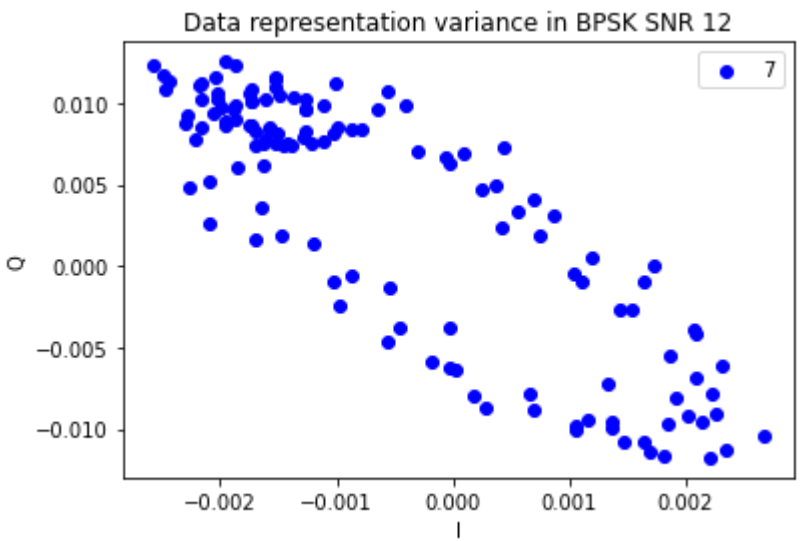

Data representation variance in BPSK SNR 12
2
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

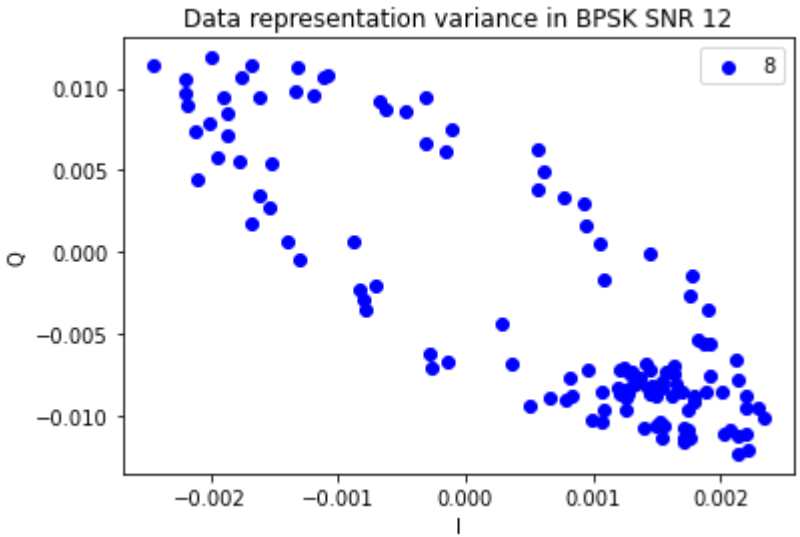

Data representation variance in BPSK SNR 12
3
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

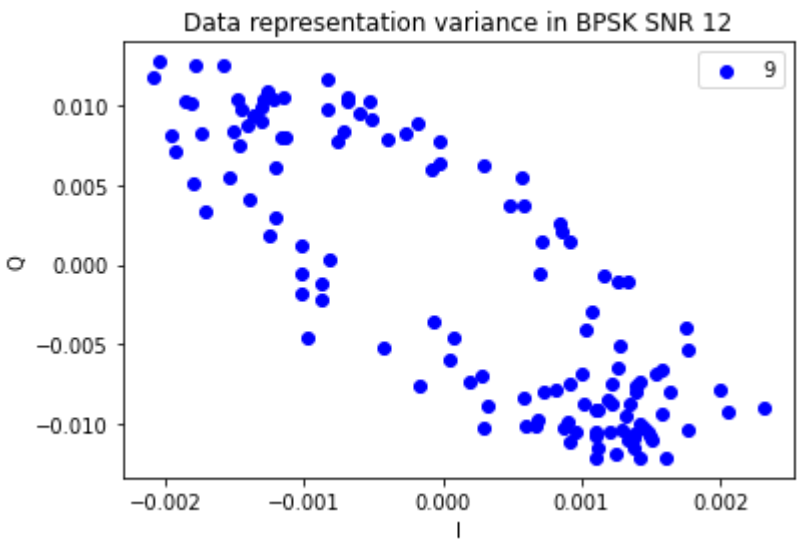

Data representation variance in BPSK SNR 12
4
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

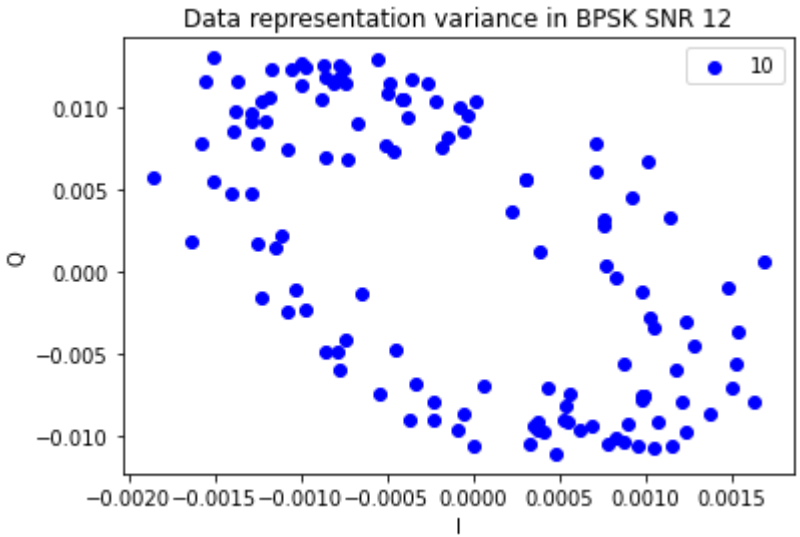

Data representation variance in BPSK SNR 12
5
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

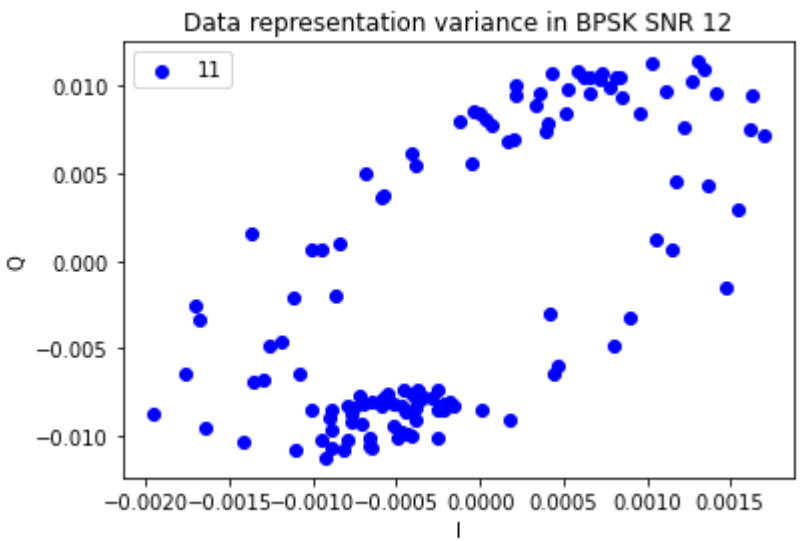

Data representation variance in BPSK SNR 12
6
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

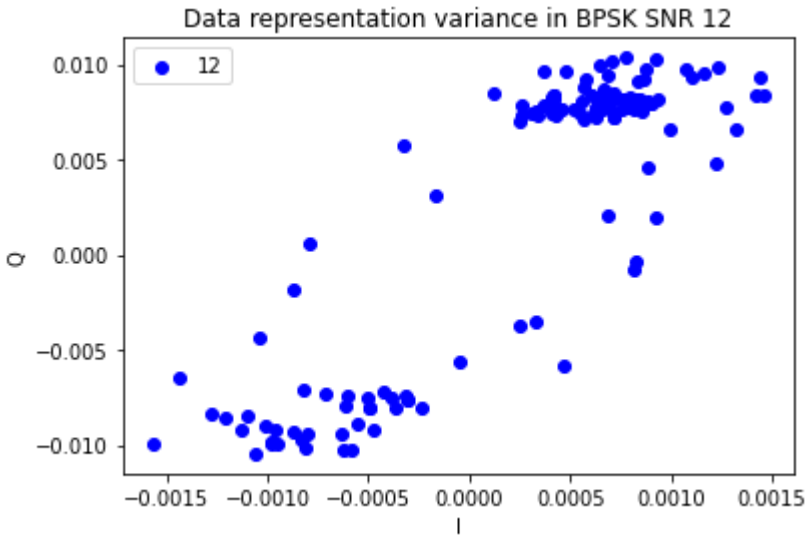

Data representation variance in BPSK SNR 12
7
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

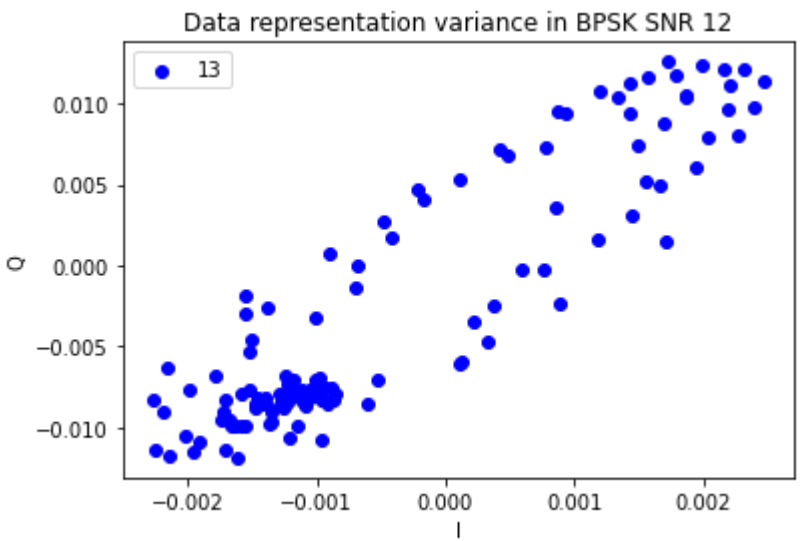

Data representation variance in BPSK SNR 12
8
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

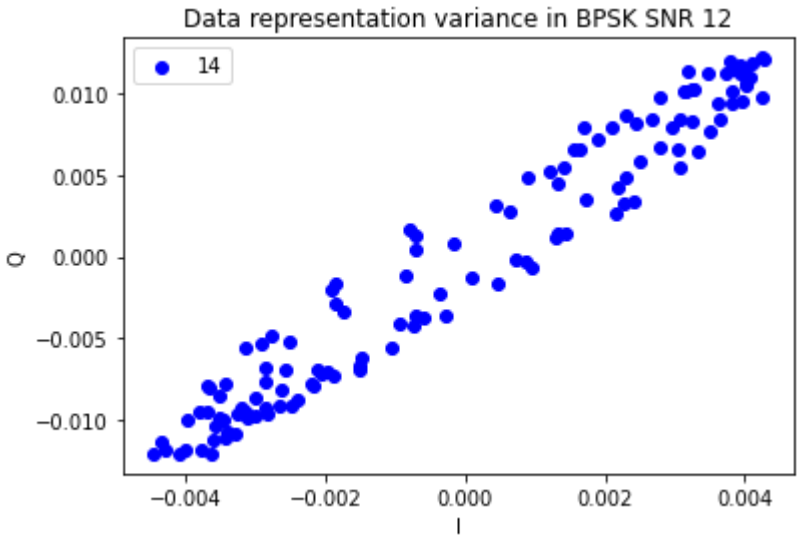

Data representation variance in BPSK SNR 12
9
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

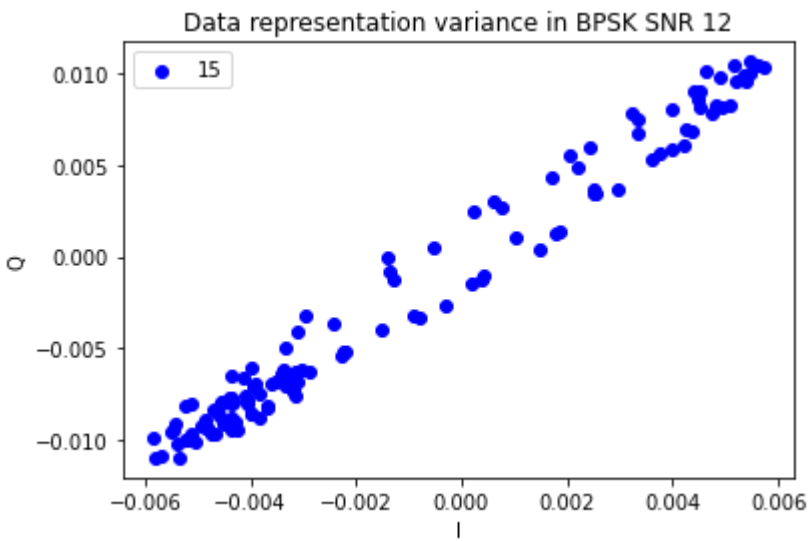

Data representation variance in BPSK SNR 12
10
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

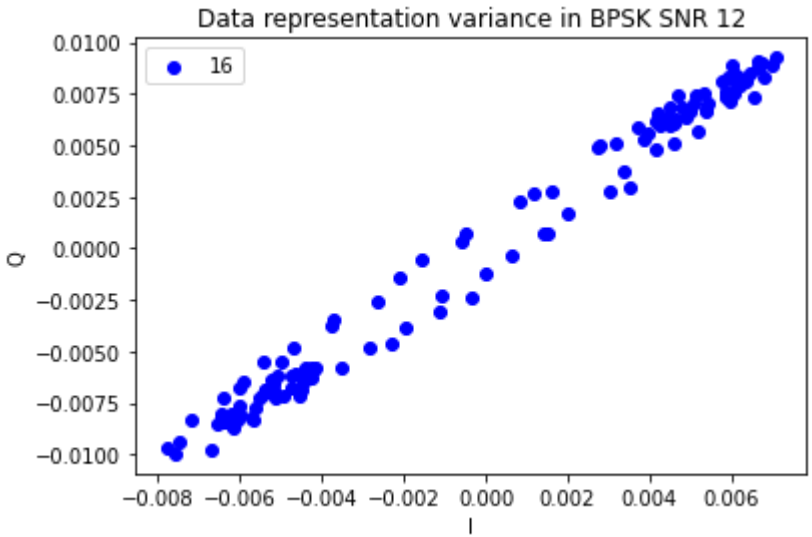

Data representation variance in BPSK SNR 12
11
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

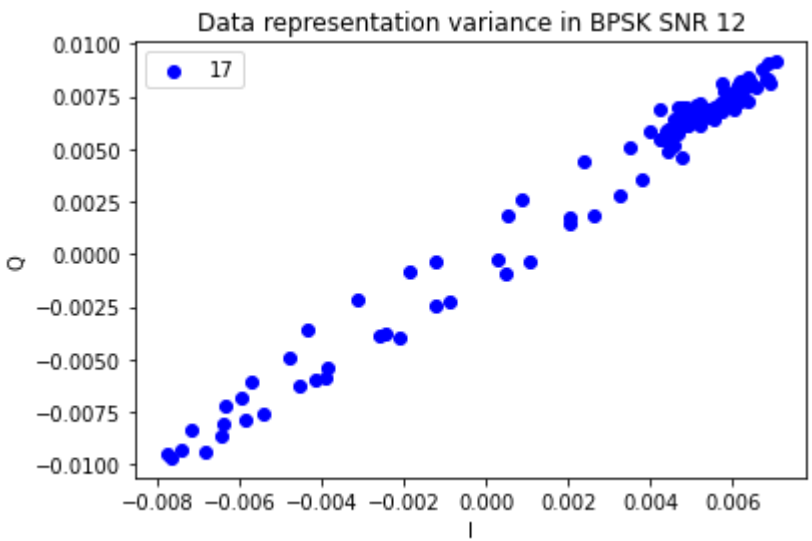

Data representation variance in BPSK SNR 12
12
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

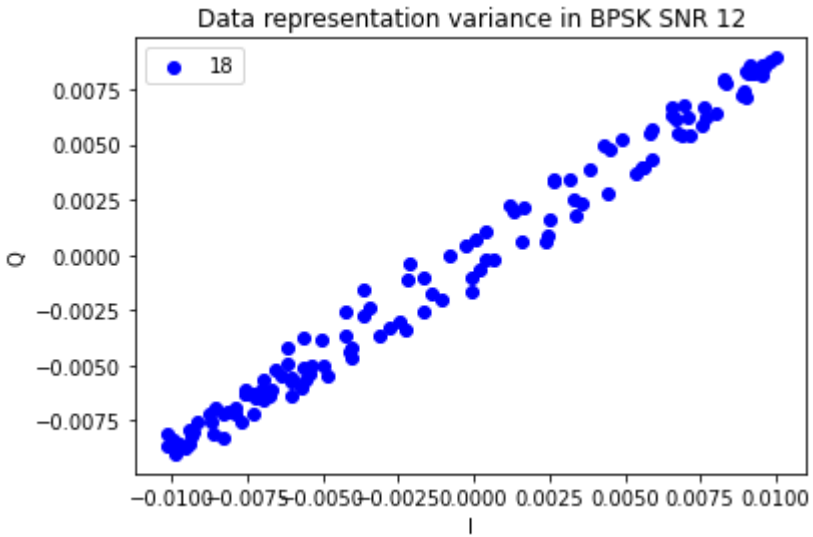

Data representation variance in BPSK SNR 12
13
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

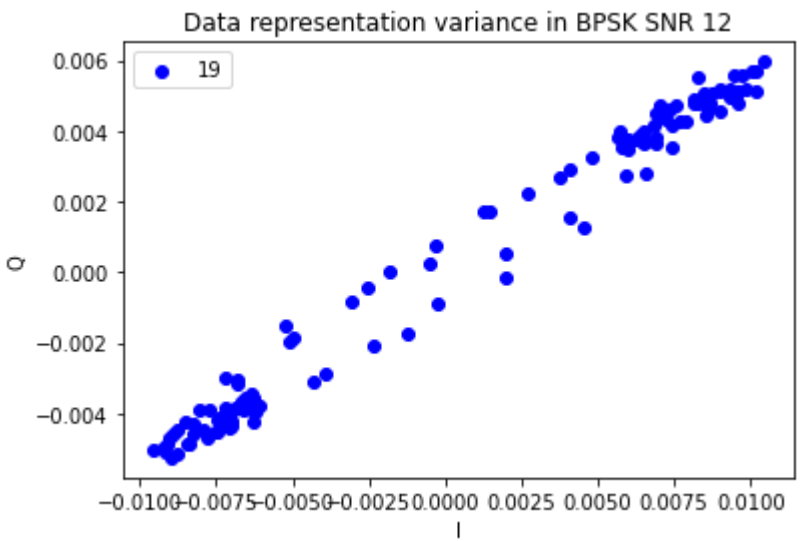

Data representation variance in BPSK SNR 12
14
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

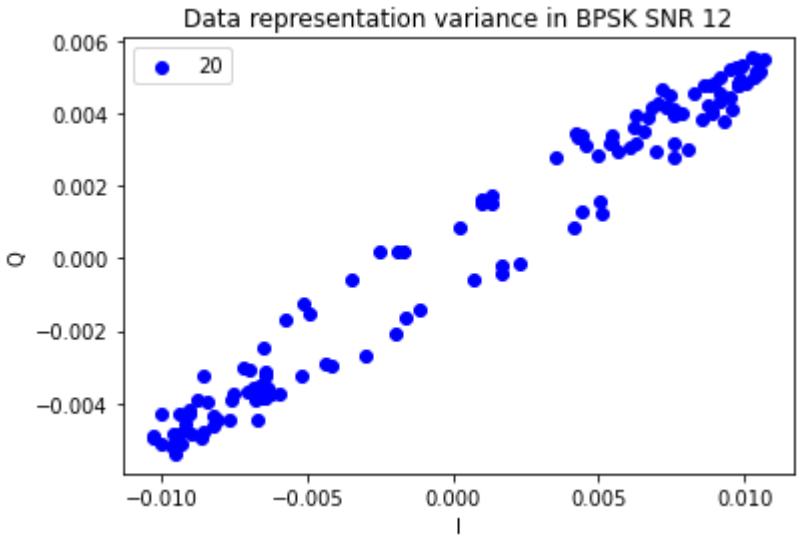

Data representation variance in BPSK SNR 12
15
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

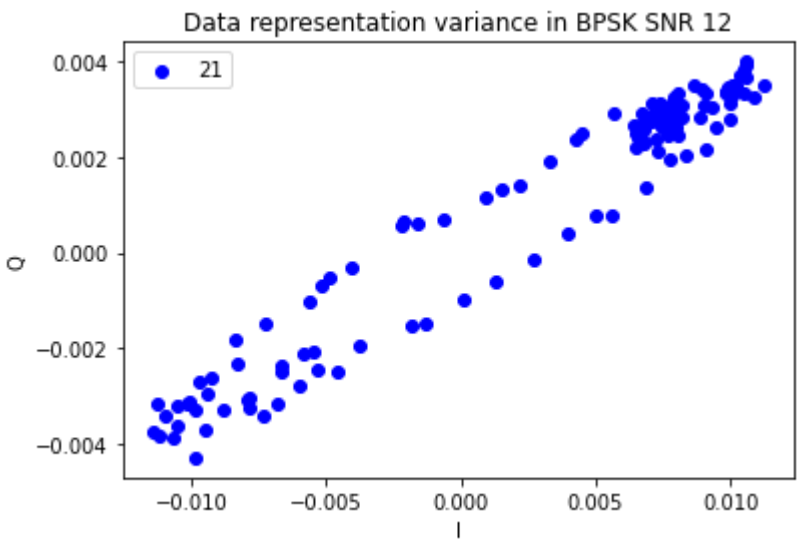

Data representation variance in BPSK SNR 12
16
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I

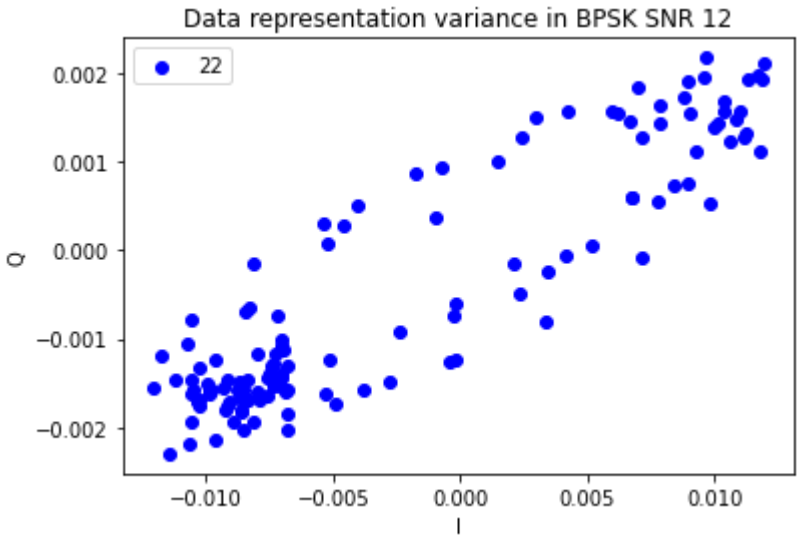

Data representation variance in BPSK SNR 12
17
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I

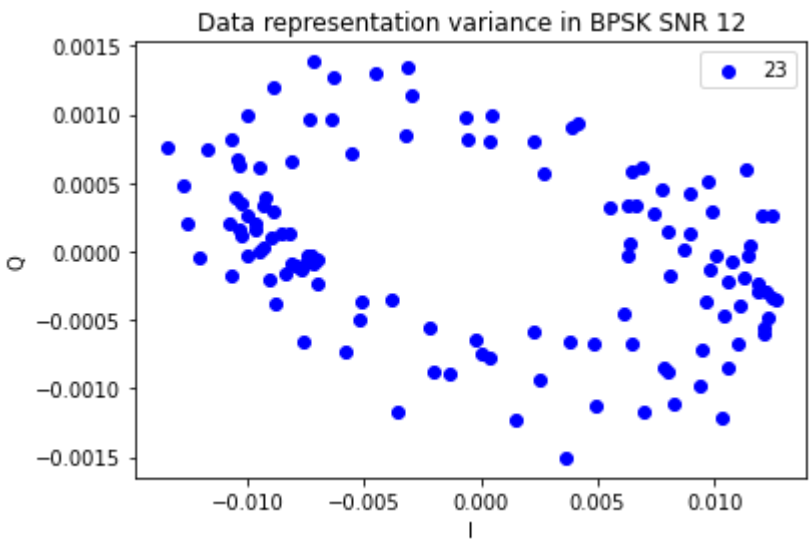

Data representation variance in BPSK SNR 12
18
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

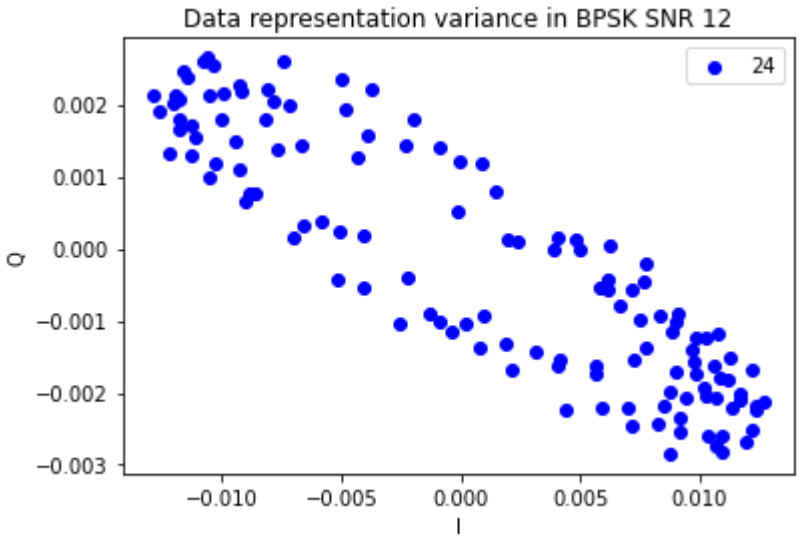

Data representation variance in BPSK SNR 12
19
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

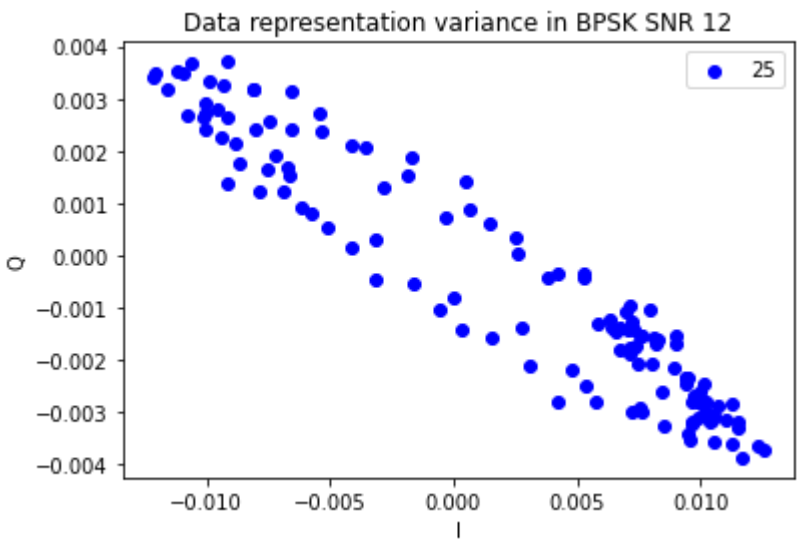

Data representation variance in BPSK SNR 12
20
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

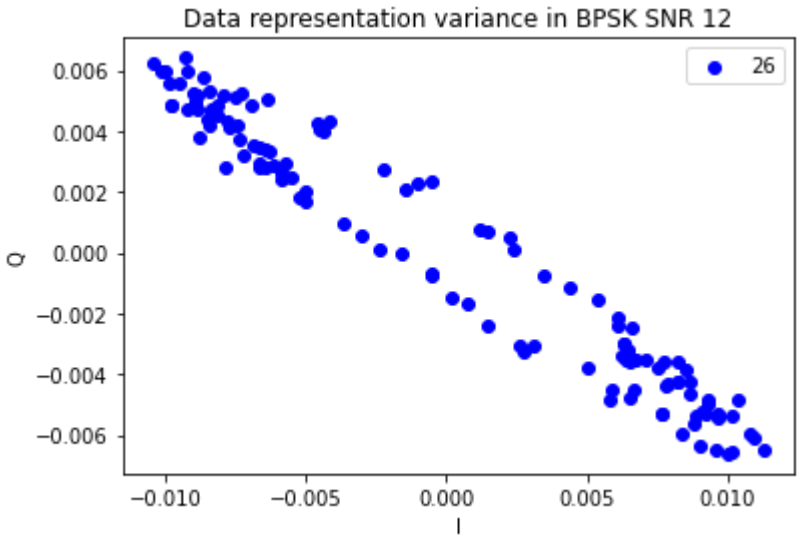

Data representation variance in BPSK SNR 12
21
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

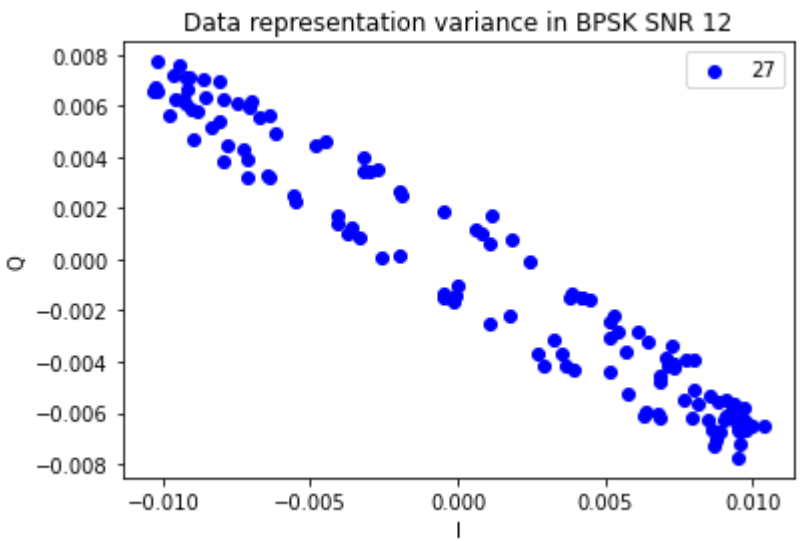

Data representation variance in BPSK SNR 12
22
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

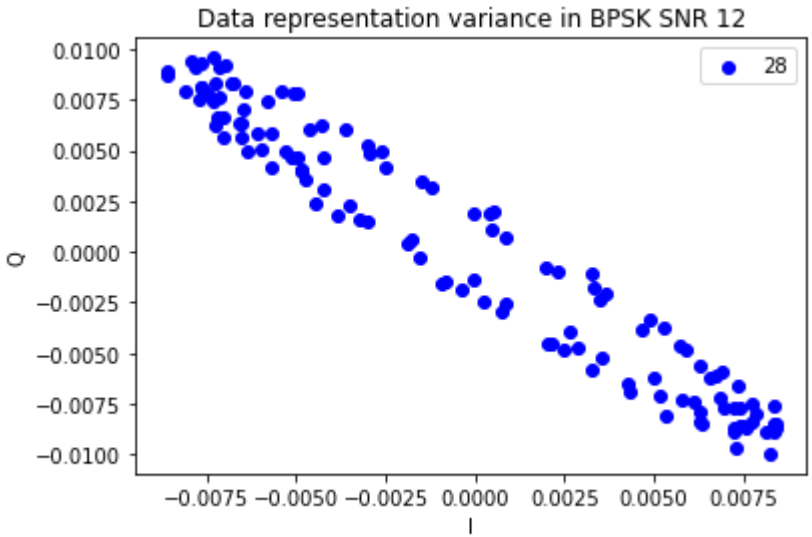

Data representation variance in BPSK SNR 12
23
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

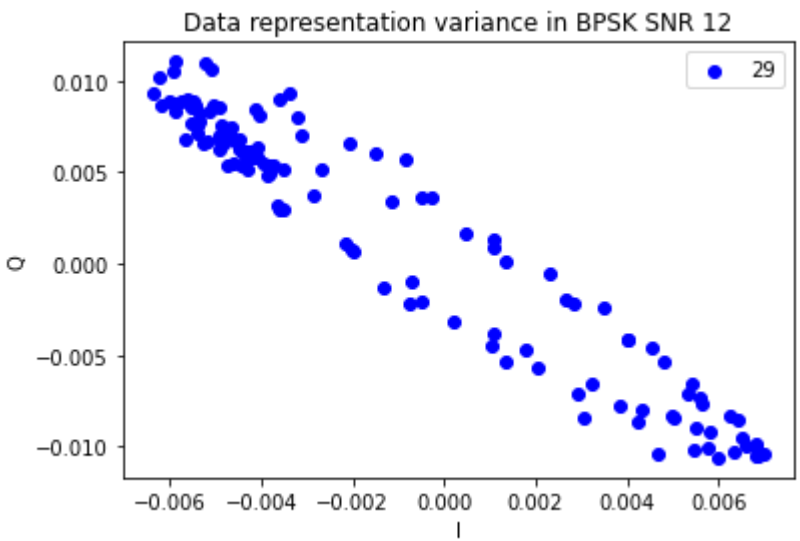

Data representation variance in BPSK SNR 12
24
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

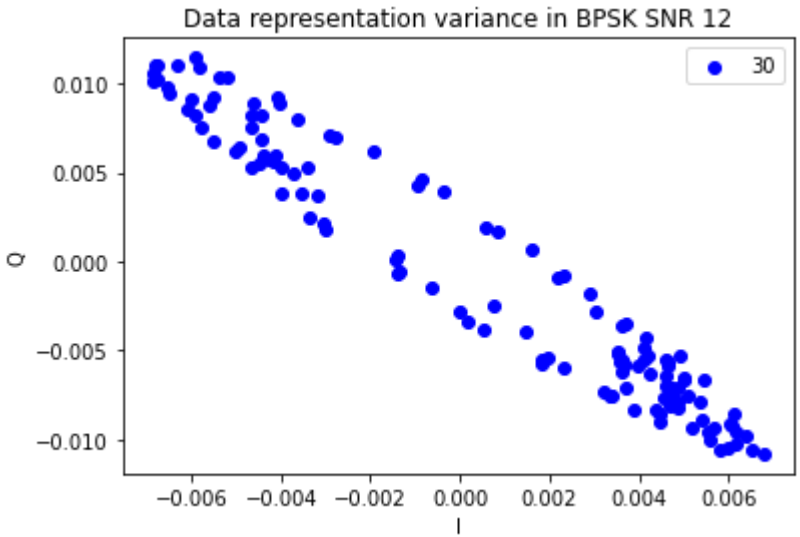

Data representation variance in BPSK SNR 12
25
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

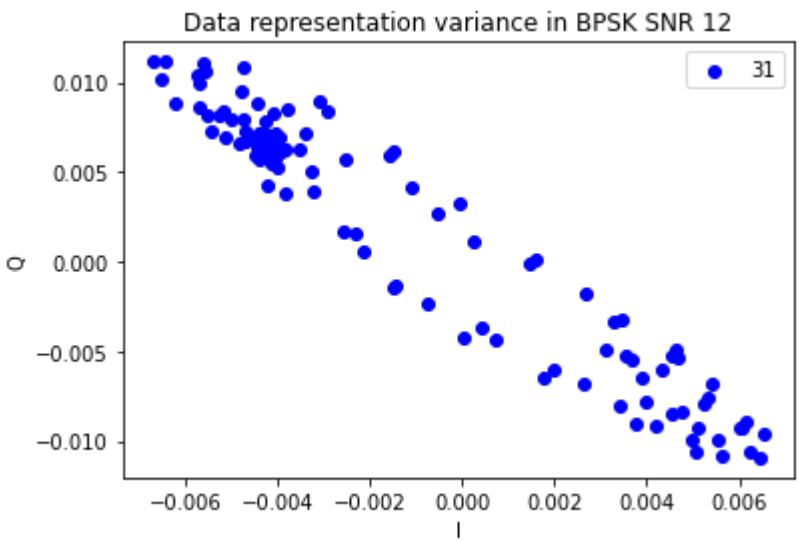

Data representation variance in BPSK SNR 12
26
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

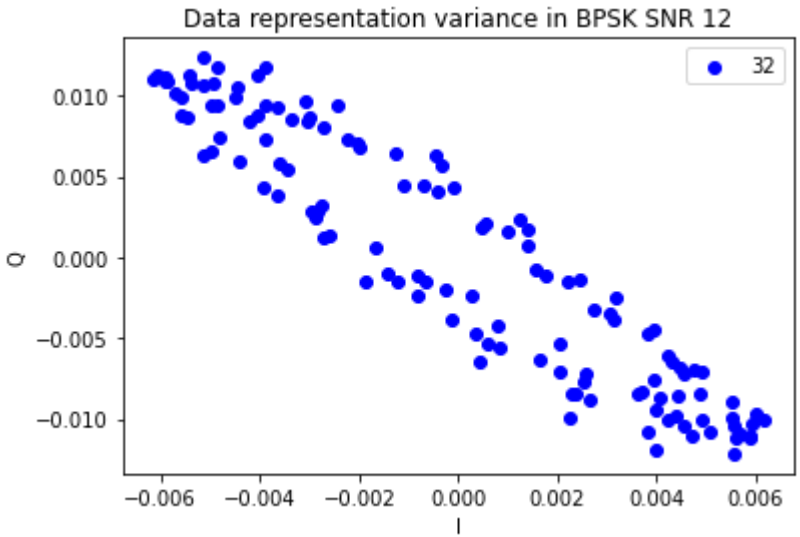

Data representation variance in BPSK SNR 12
27
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I

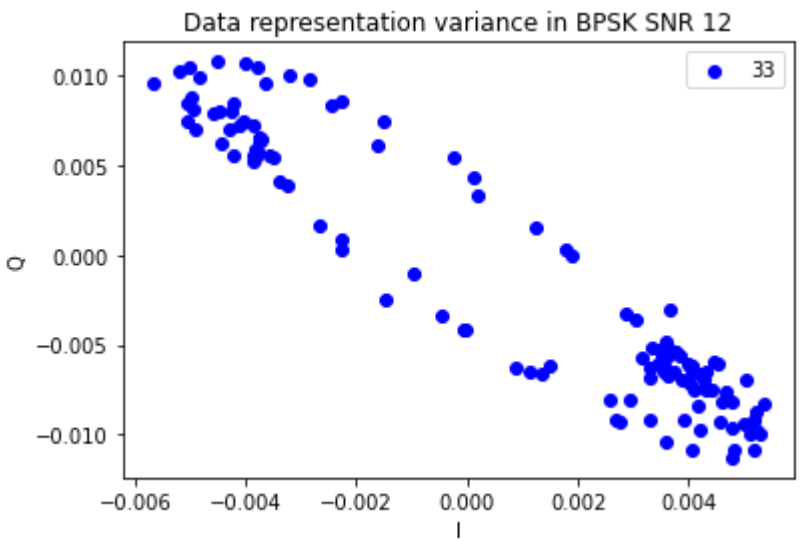

Data representation variance in BPSK SNR 12
28
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

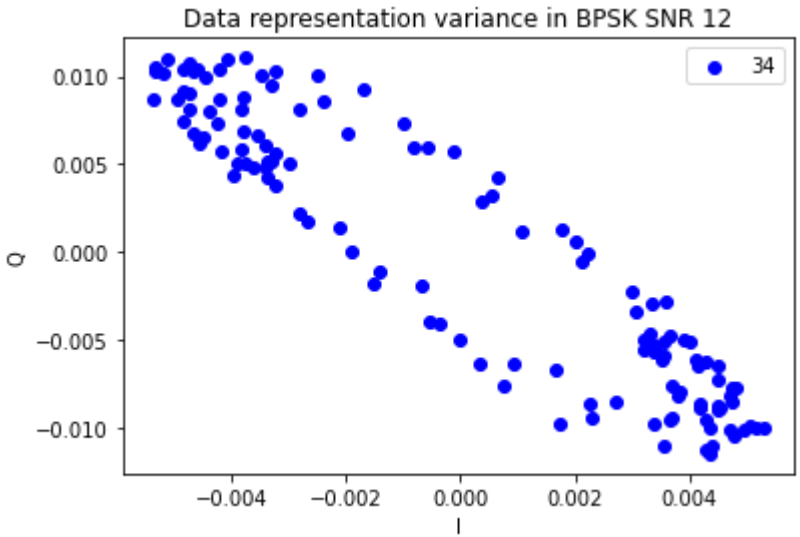

Data representation variance in BPSK SNR 12
29
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I

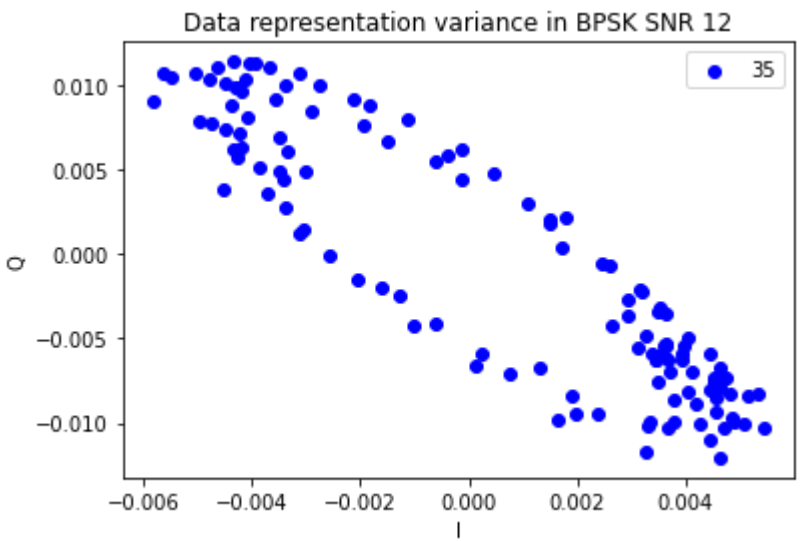

Data representation variance in BPSK SNR 12
30
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

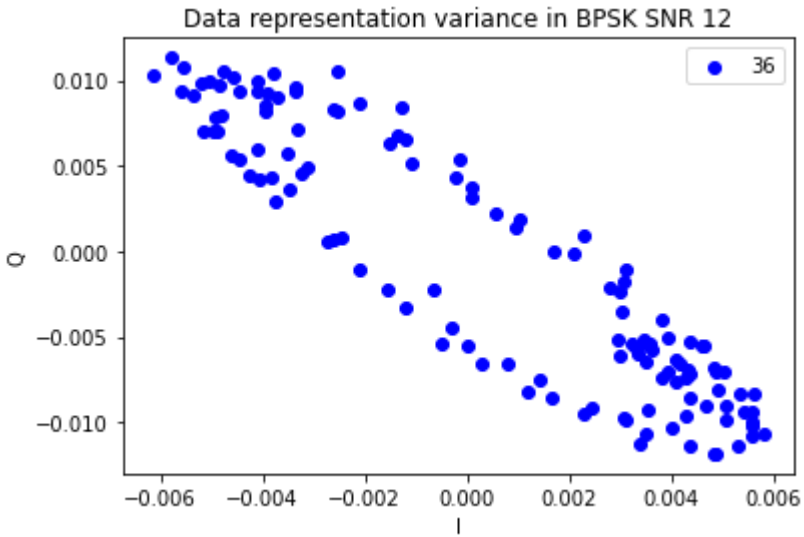

Data representation variance in BPSK SNR 12
31
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

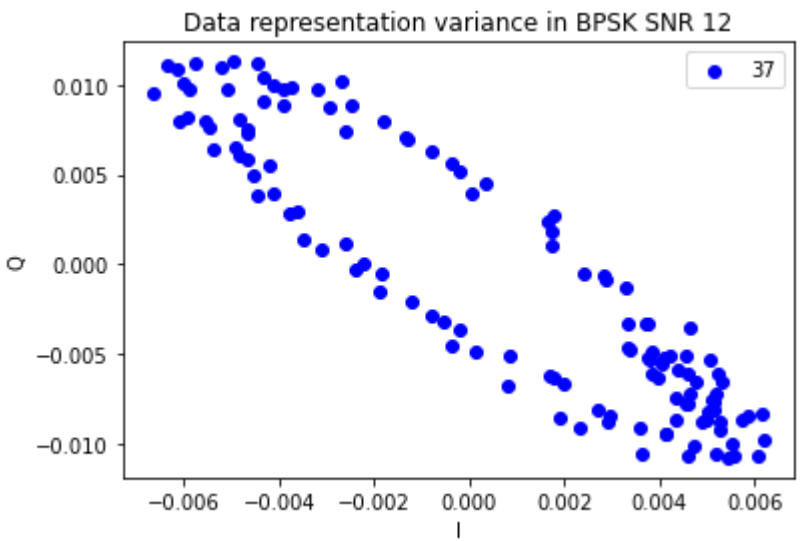

Data representation variance in BPSK SNR 12
32
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

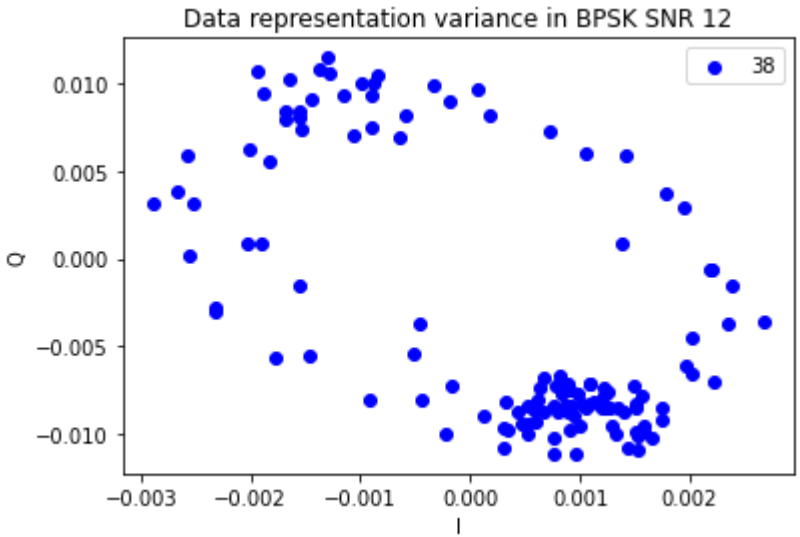

Data representation variance in BPSK SNR 12
33
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I

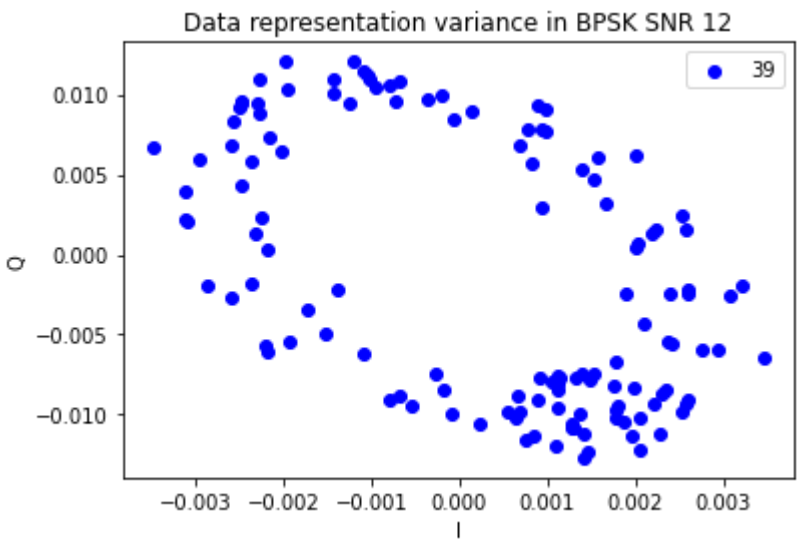

Data representation variance in BPSK SNR 12
34
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

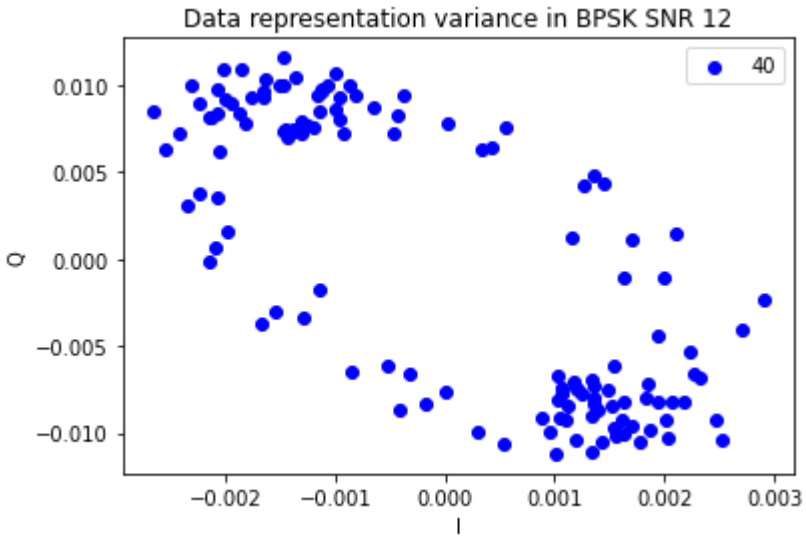

Data representation variance in BPSK SNR 12
35
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I

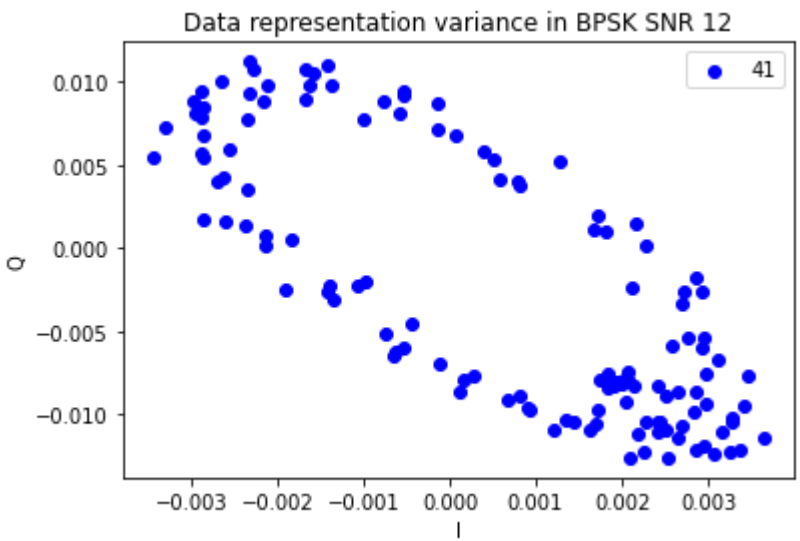

Data representation variance in BPSK SNR 12
36
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

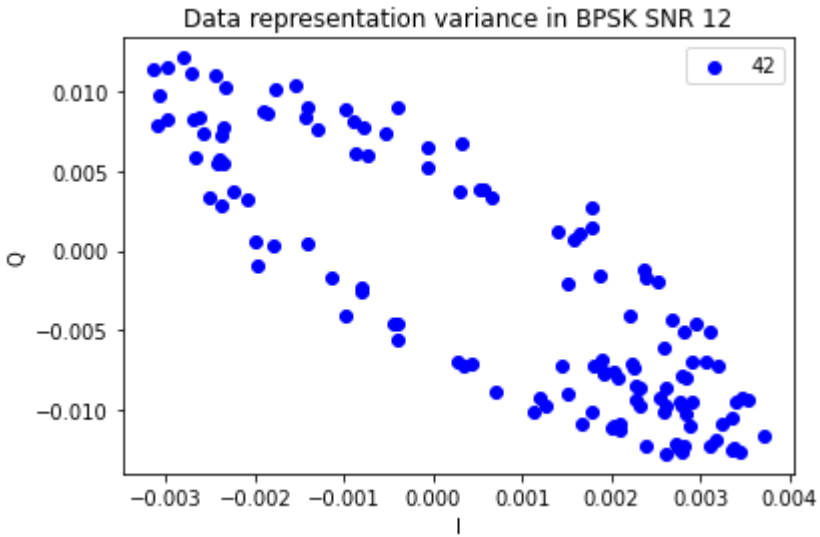

Data representation variance in BPSK SNR 12
37
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

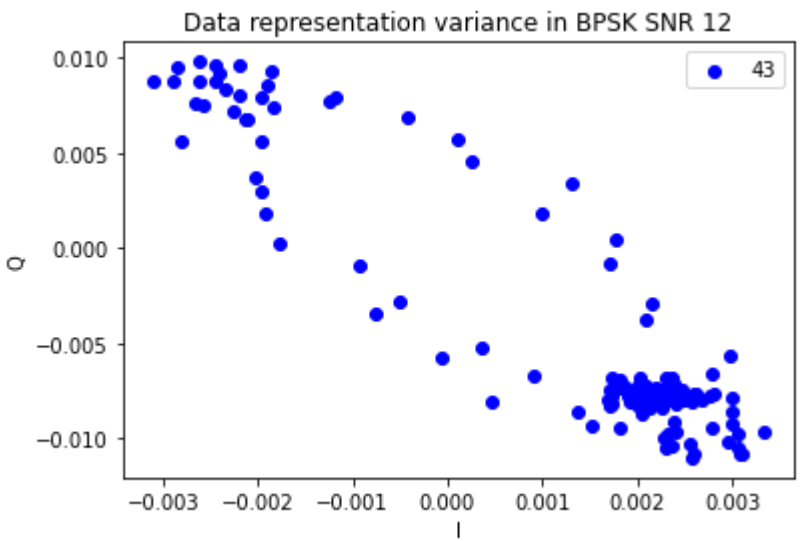

Data representation variance in BPSK SNR 12
38
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

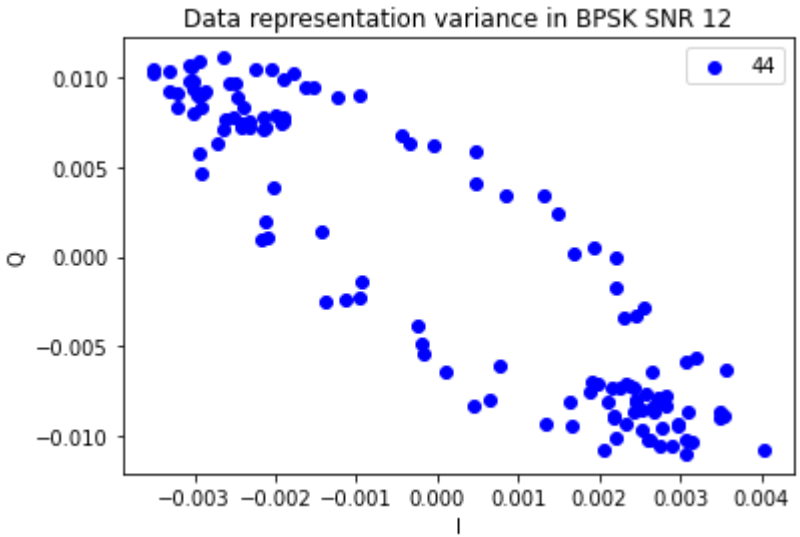

Data representation variance in BPSK SNR 12
39
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

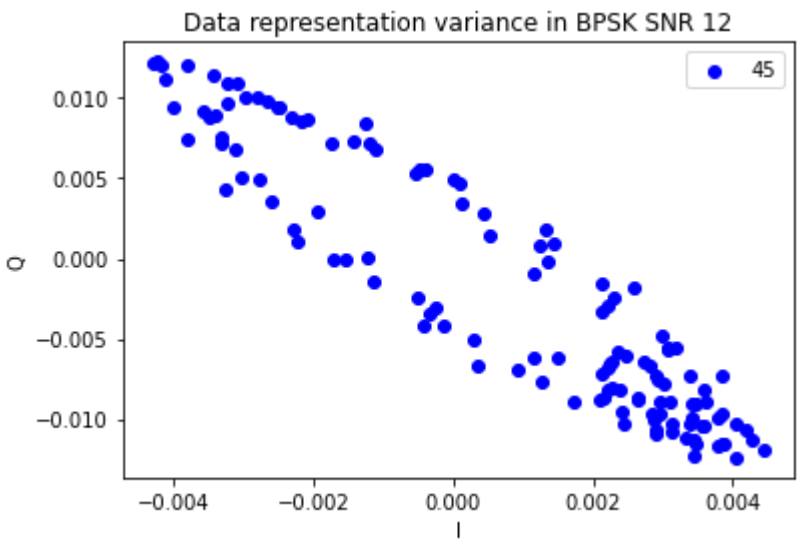

Data representation variance in BPSK SNR 12
40
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

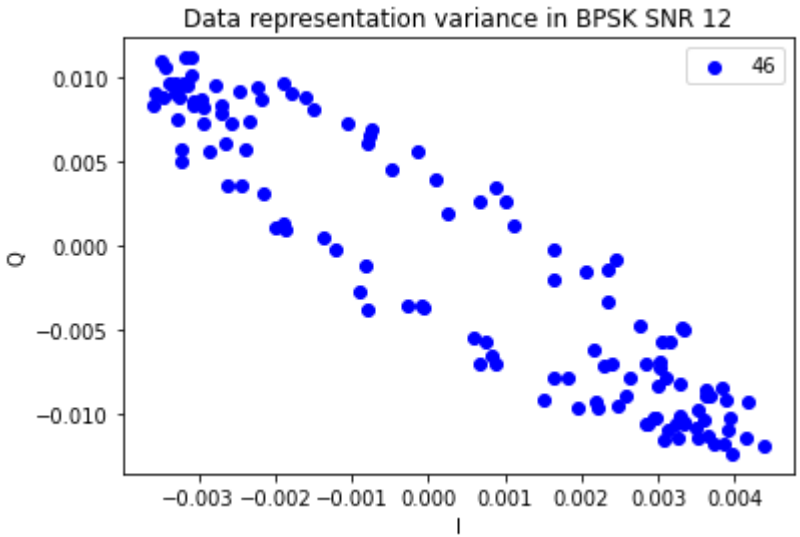

Data representation variance in BPSK SNR 12
41
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

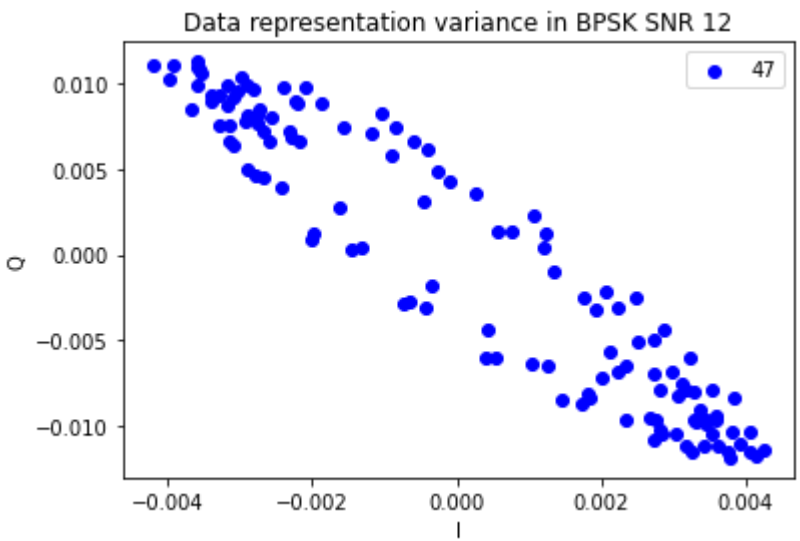

Data representation variance in BPSK SNR 12
42
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I

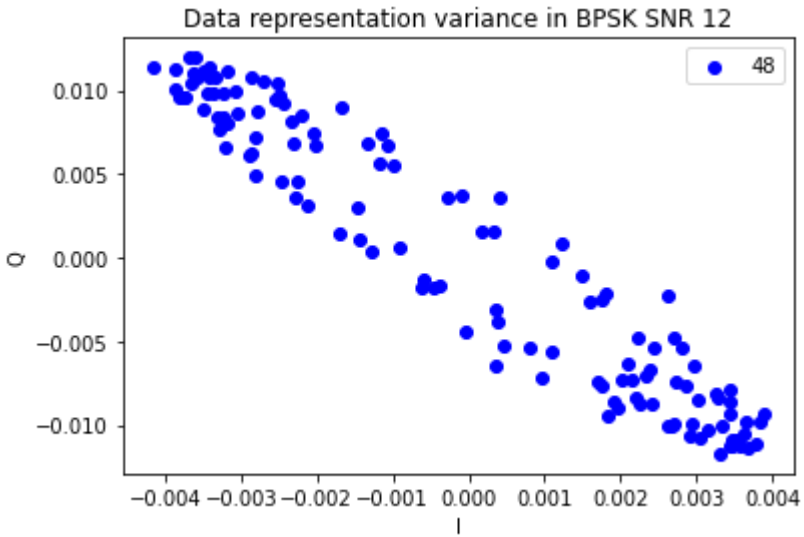

Data representation variance in BPSK SNR 12
43
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

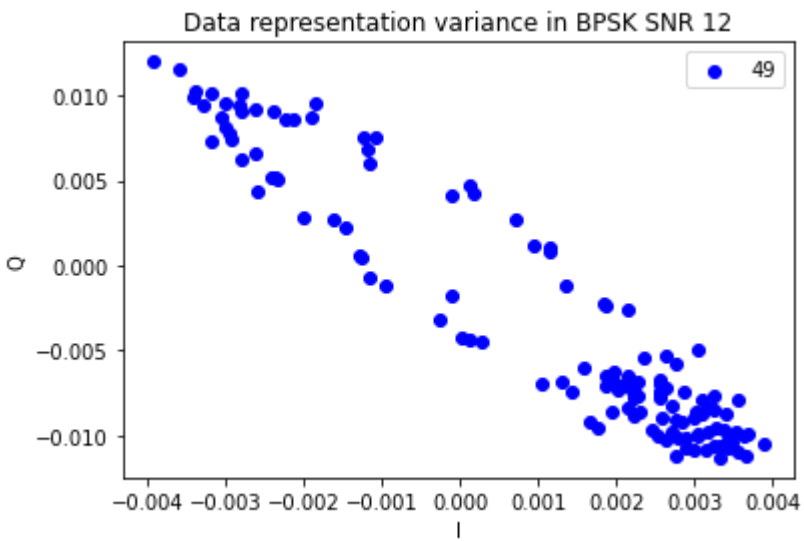

Data representation variance in BPSK SNR 12
44
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

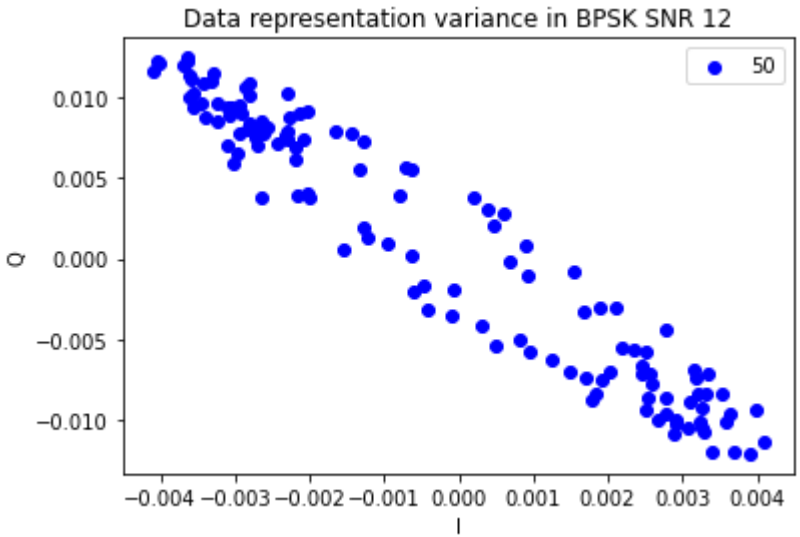

Data representation variance in BPSK SNR 12
45
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

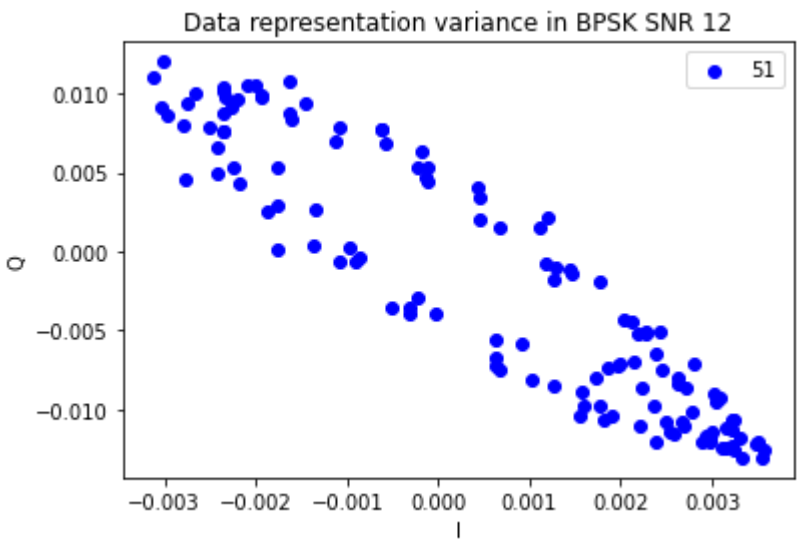

Data representation variance in BPSK SNR 12
46
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

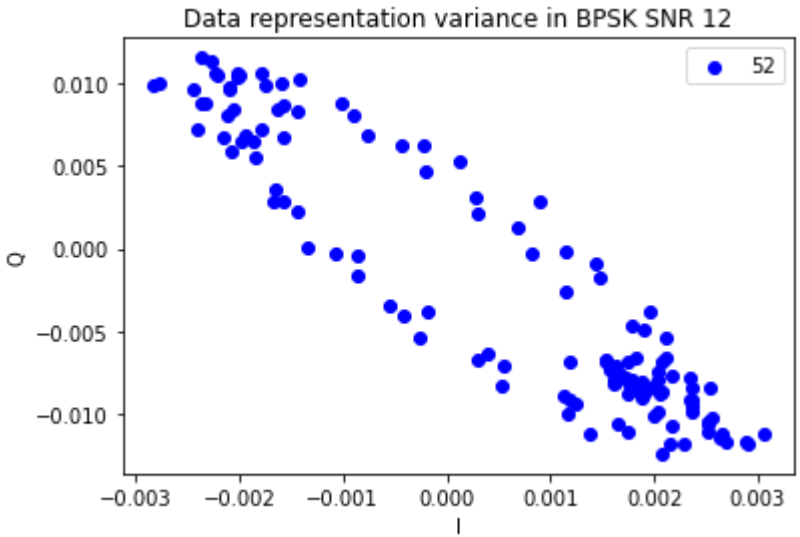

Data representation variance in BPSK SNR 12
47
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

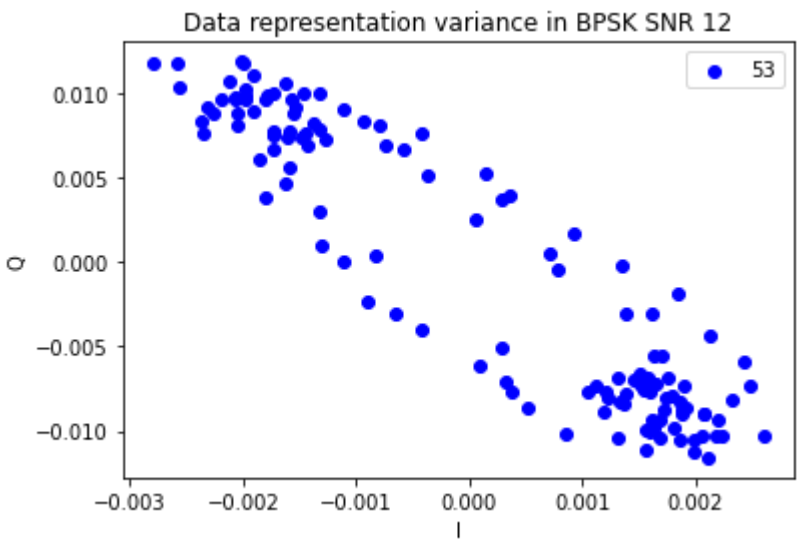

Data representation variance in BPSK SNR 12
48
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

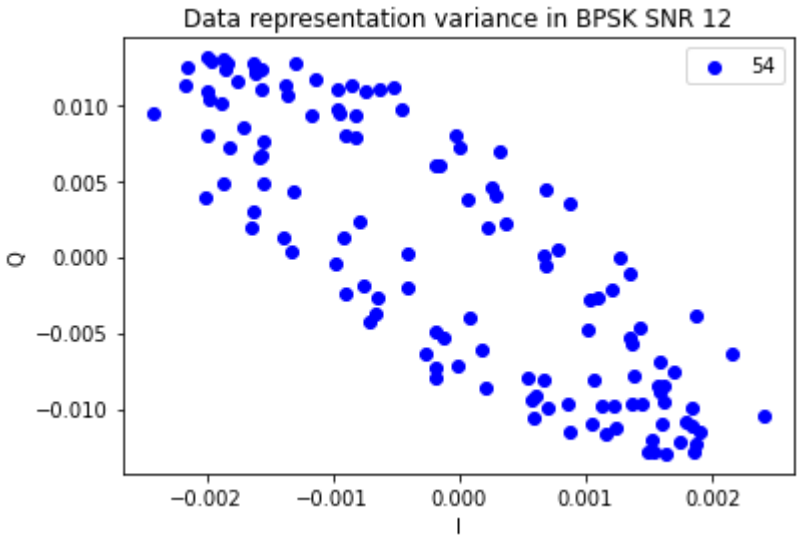

Data representation variance in BPSK SNR 12
49
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

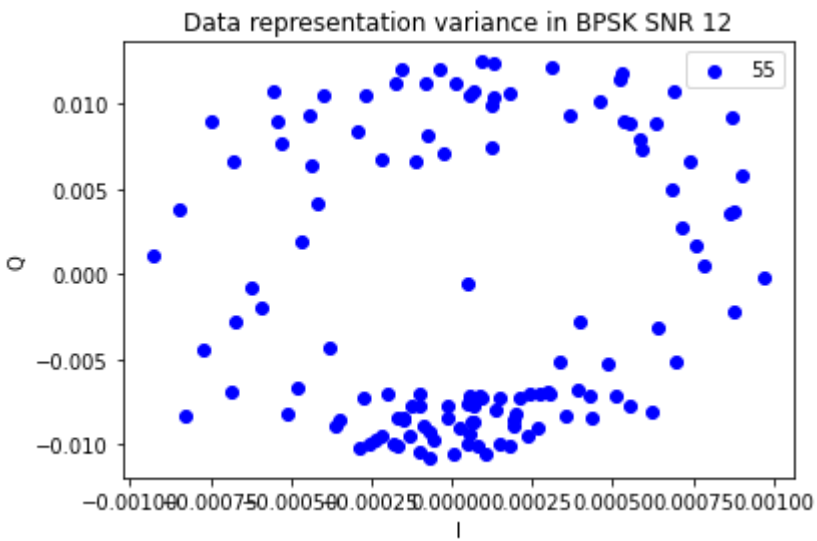

Data representation variance in BPSK SNR 12
50
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

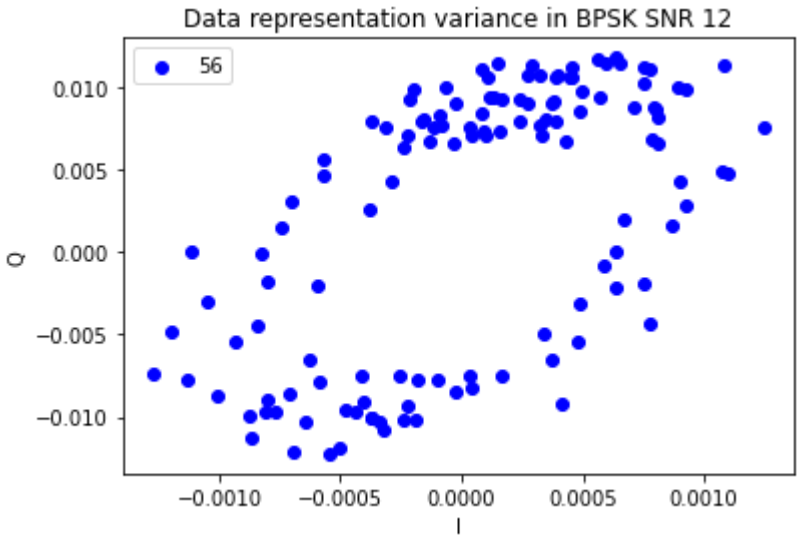

Data representation variance in BPSK SNR 12
51
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

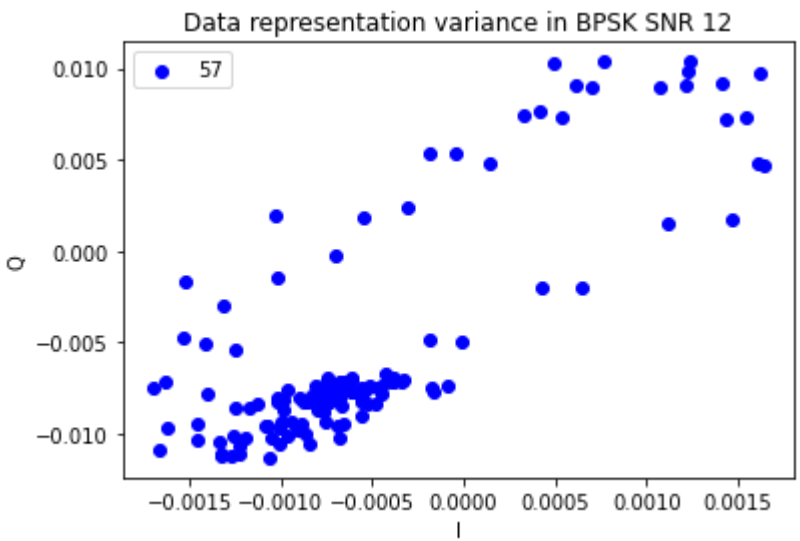

Data representation variance in BPSK SNR 12
52
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

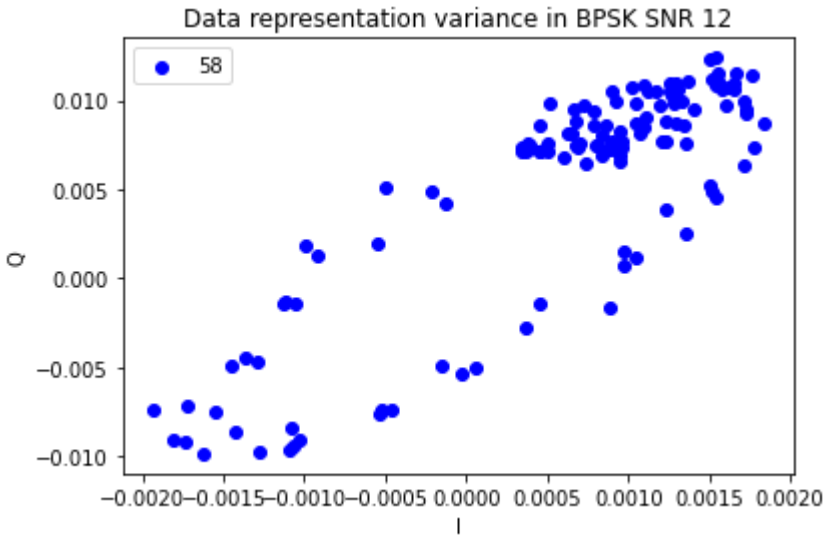

Data representation variance in BPSK SNR 12
53
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

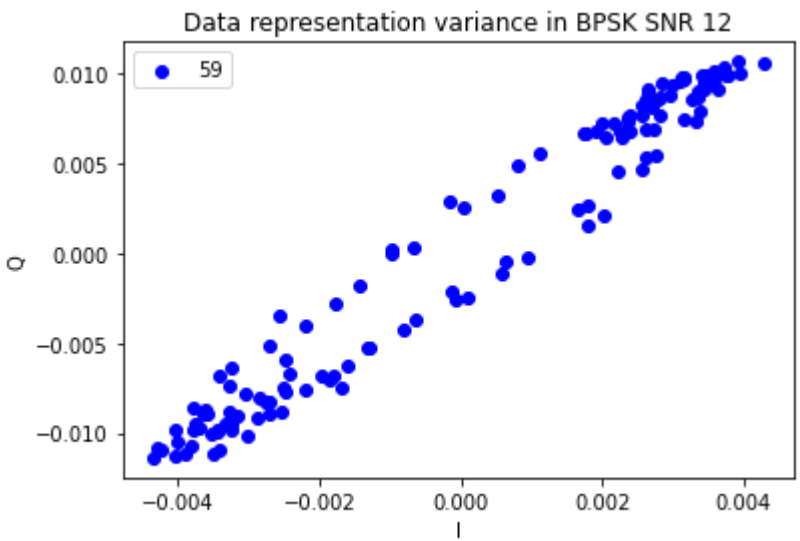

Data representation variance in BPSK SNR 12
54
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

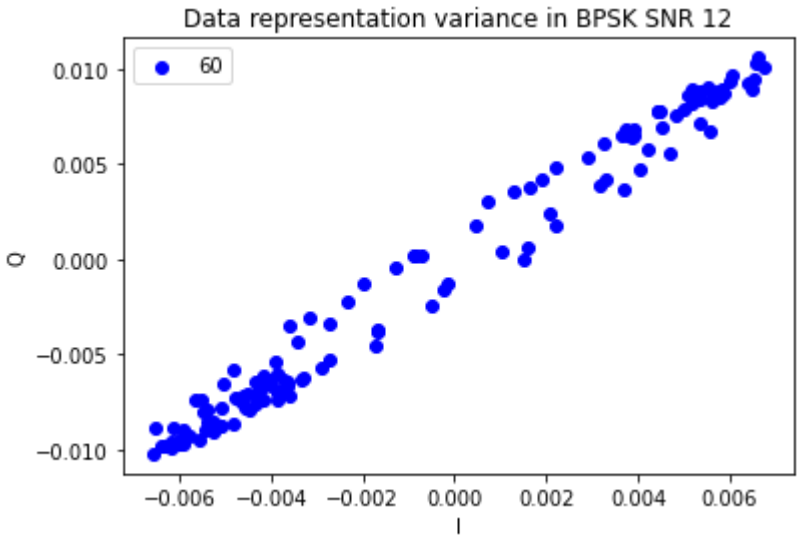

Data representation variance in BPSK SNR 12
55
0.010
0.005
0.000
−0.005
−0.010
Q
I

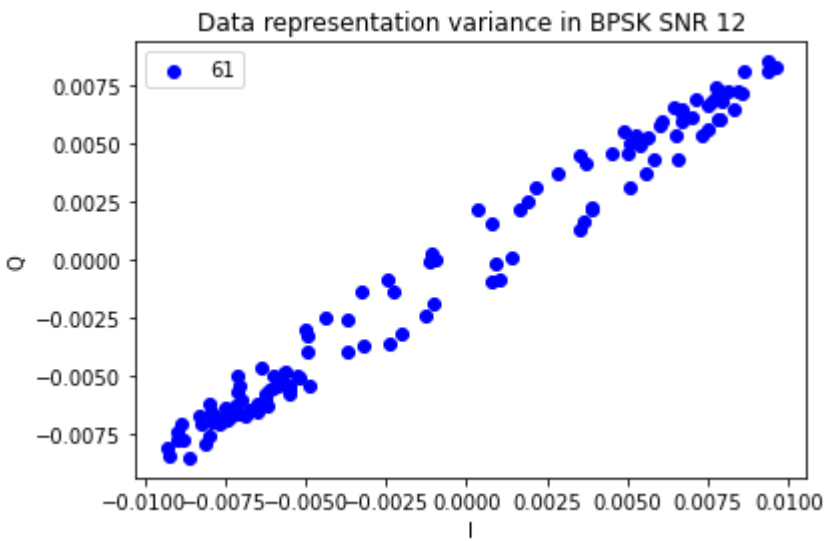

Data representation variance in BPSK SNR 12
56
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0010
−0.0005
0.0000
0.0005
0.0010
I

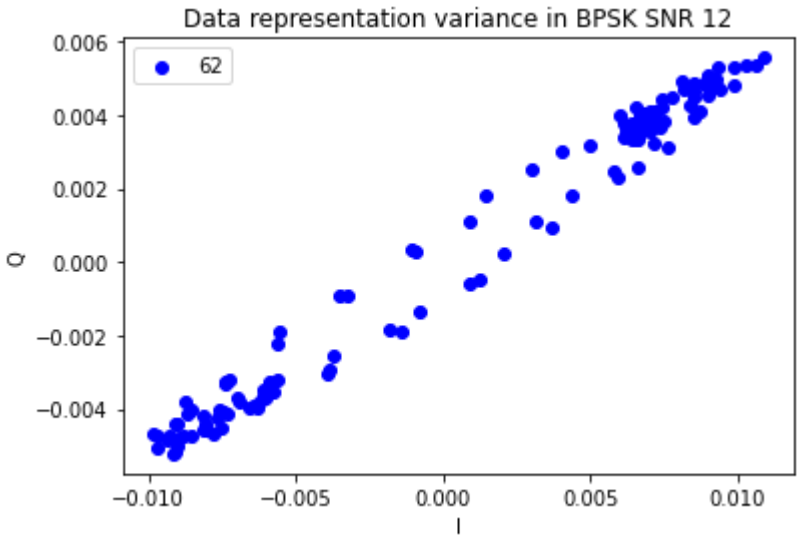

Data representation variance in BPSK SNR 12
57
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

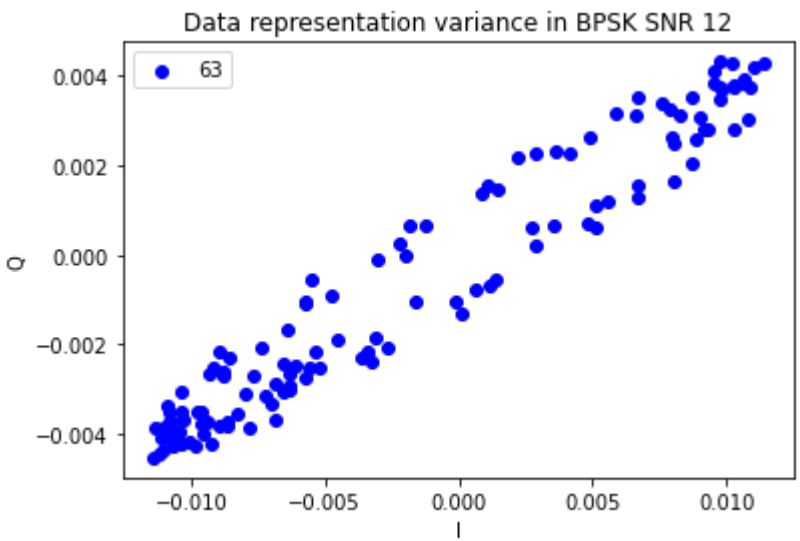

Data representation variance in BPSK SNR 12
58
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

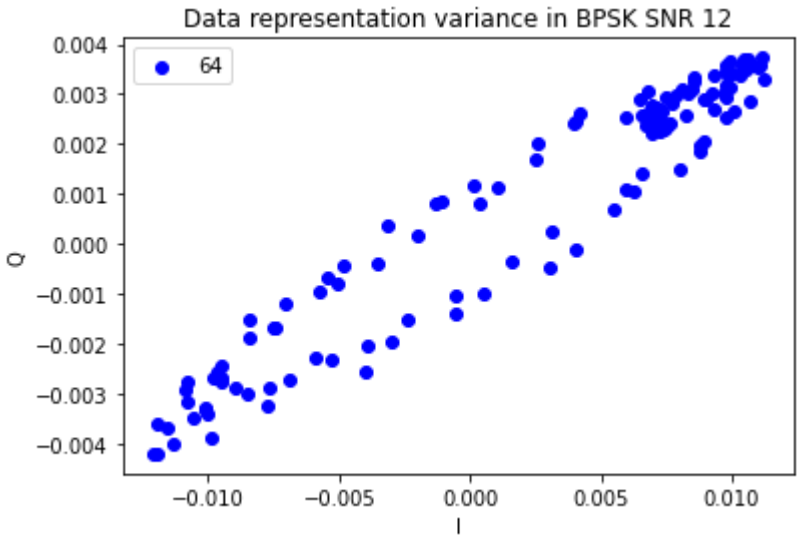

Data representation variance in BPSK SNR 12
59
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

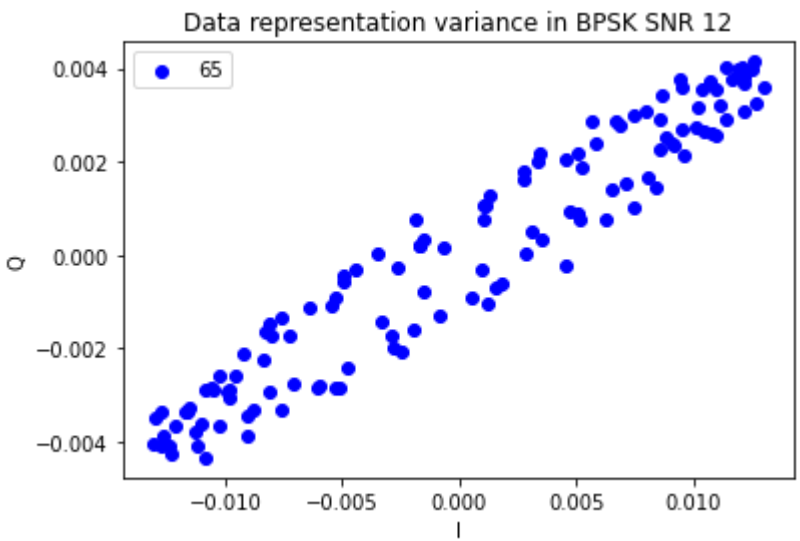

Data representation variance in BPSK SNR 12
60
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

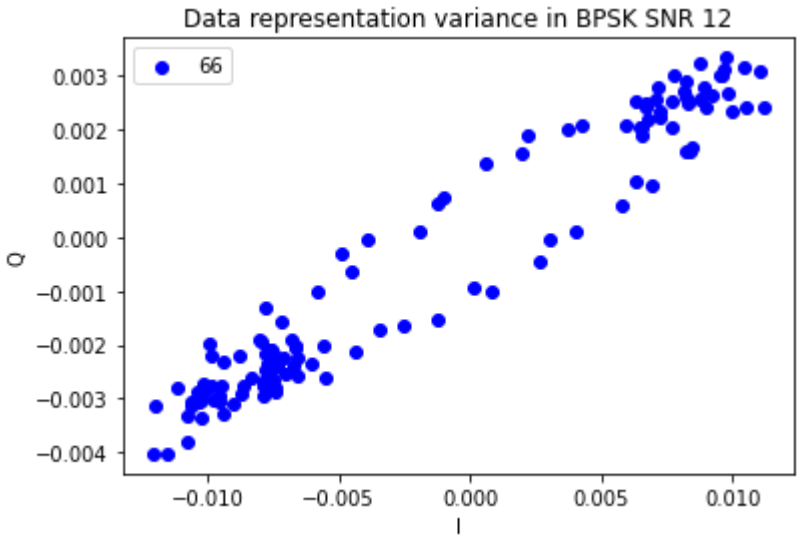

Data representation variance in BPSK SNR 12
61
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

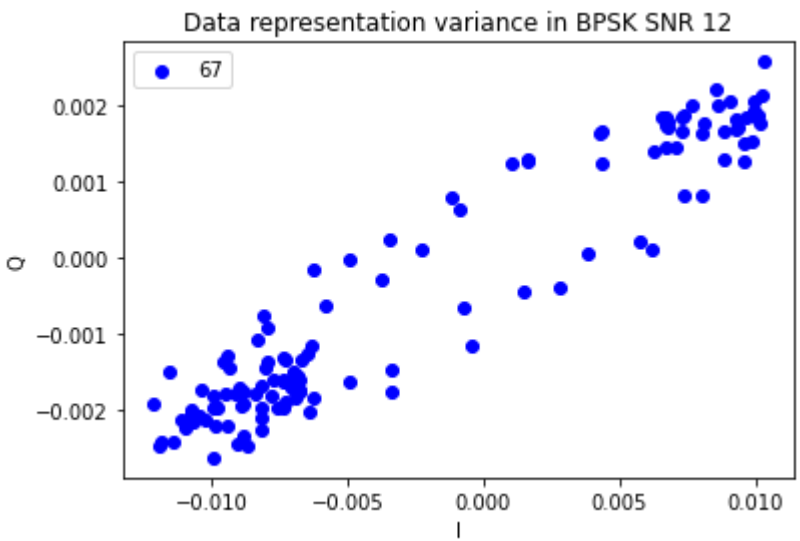

Data representation variance in BPSK SNR 12
62
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

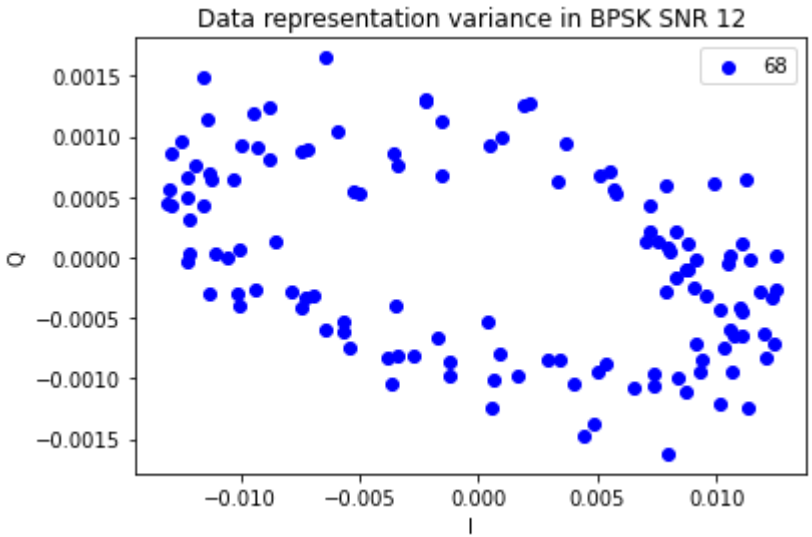

Data representation variance in BPSK SNR 12
63
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

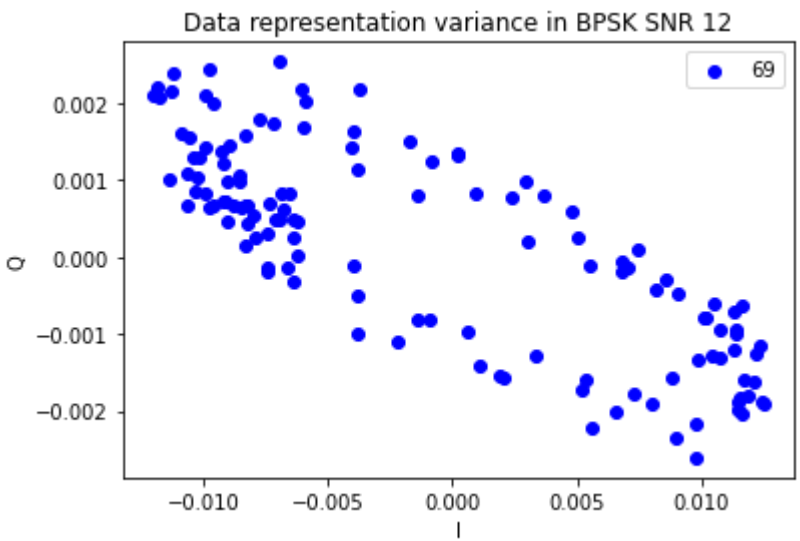

Data representation variance in BPSK SNR 12
64
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

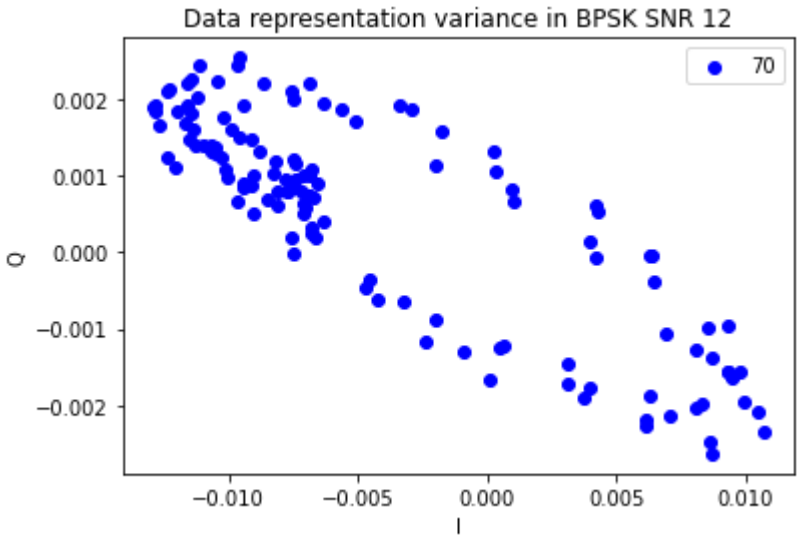

Data representation variance in BPSK SNR 12
65
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

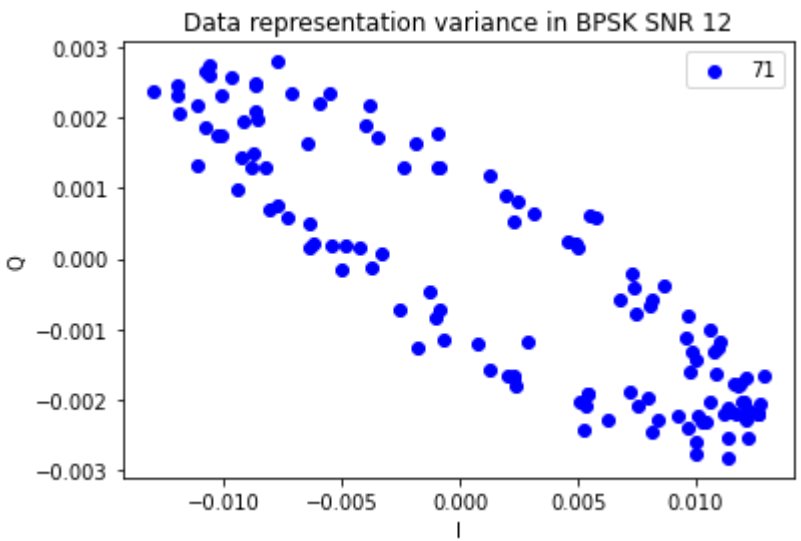

Data representation variance in BPSK SNR 12
66
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

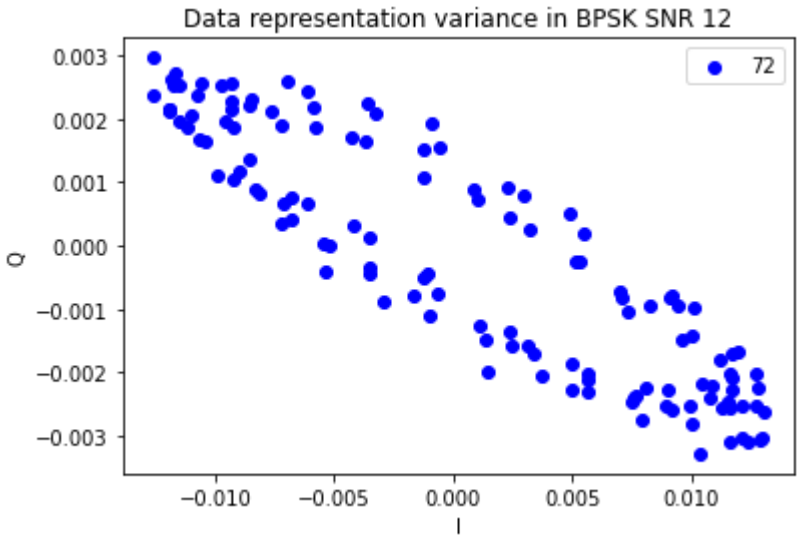

Data representation variance in BPSK SNR 12
67
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

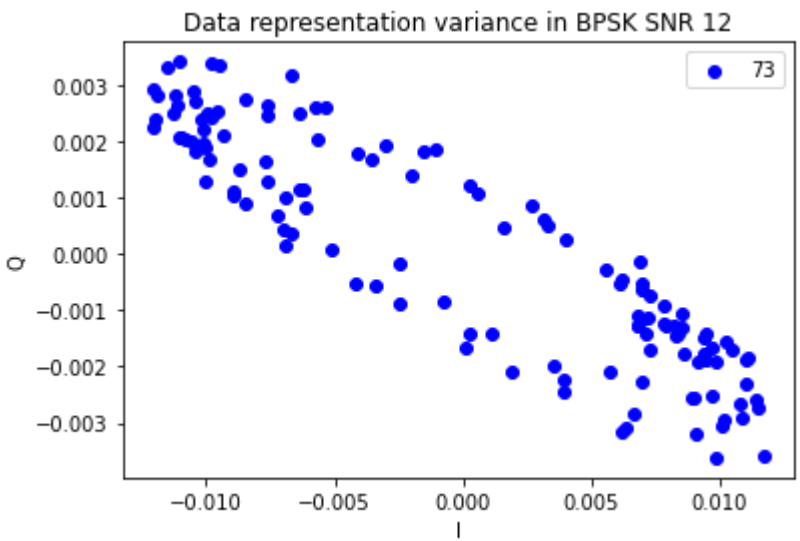

Data representation variance in BPSK SNR 12
68
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

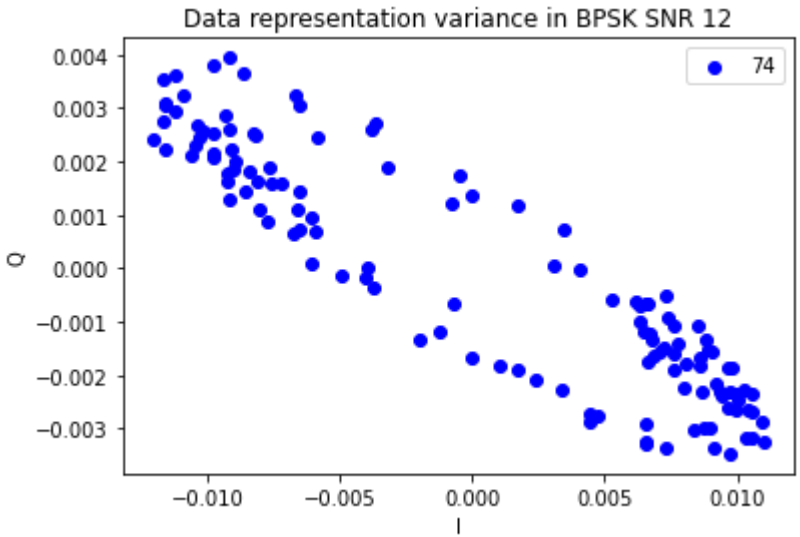

Data representation variance in BPSK SNR 12
69
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

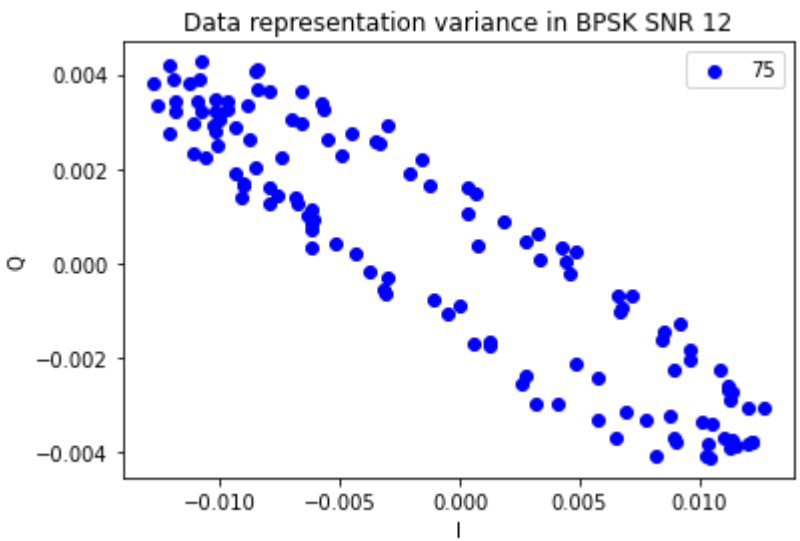

Data representation variance in BPSK SNR 12
70
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

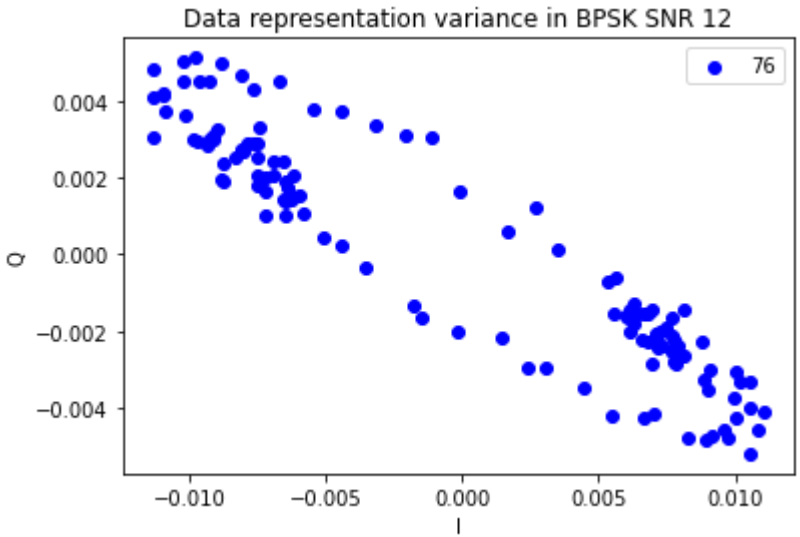

Data representation variance in BPSK SNR 12
71
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

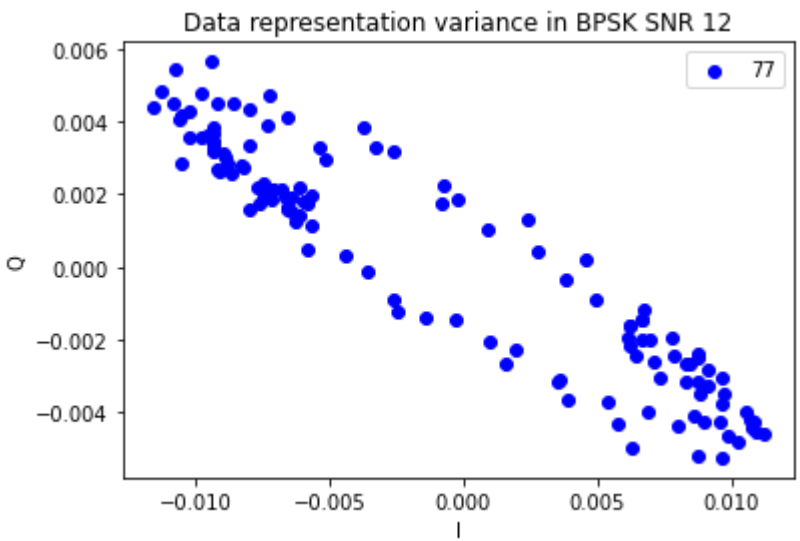

Data representation variance in BPSK SNR 12
72
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

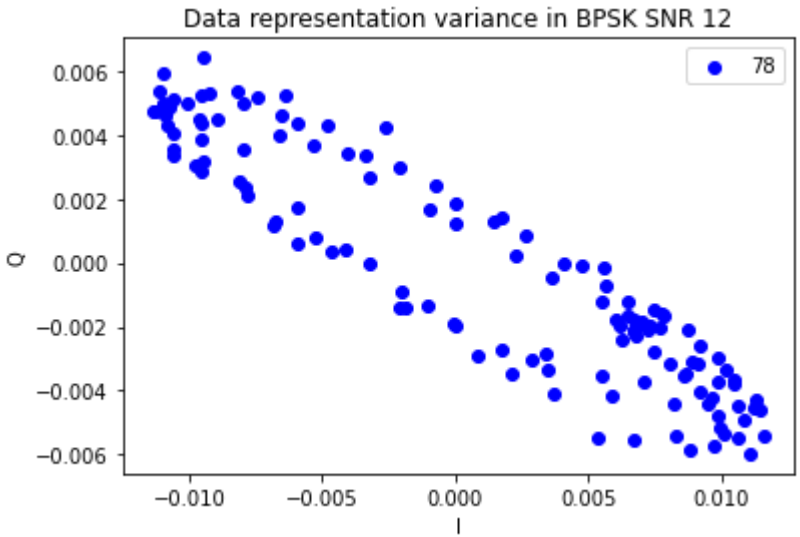

Data representation variance in BPSK SNR 12
73
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

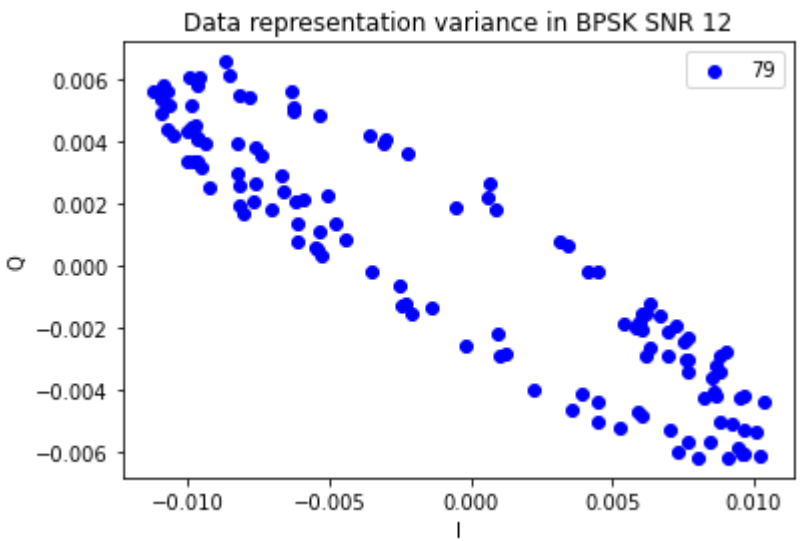

Data representation variance in BPSK SNR 12
74
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

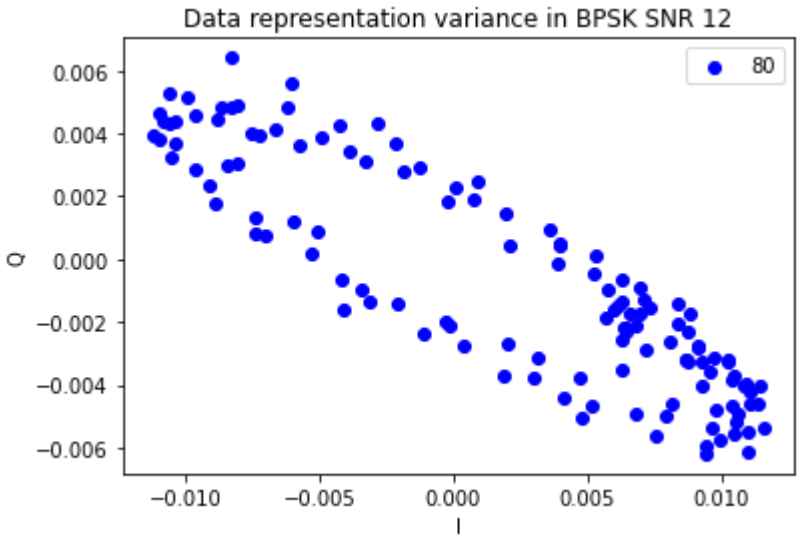

Data representation variance in BPSK SNR 12
75
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

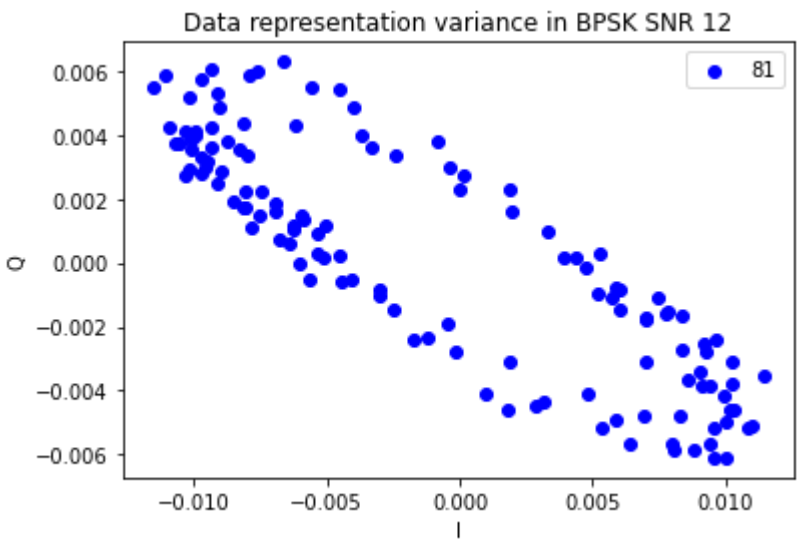

Data representation variance in BPSK SNR 12
76
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

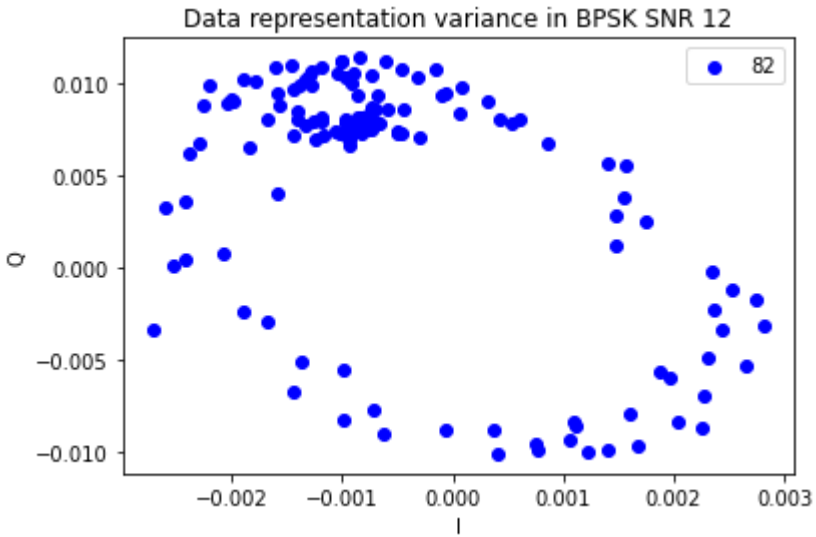

Data representation variance in BPSK SNR 12
77
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

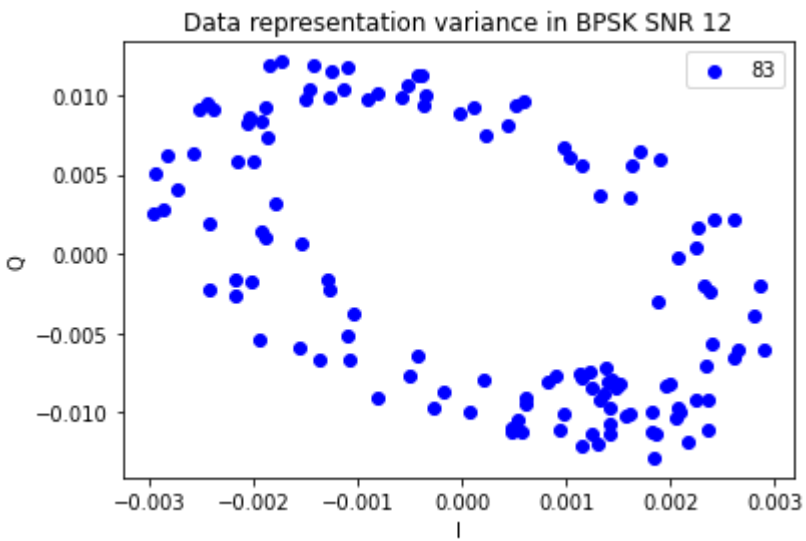

Data representation variance in BPSK SNR 12
78
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

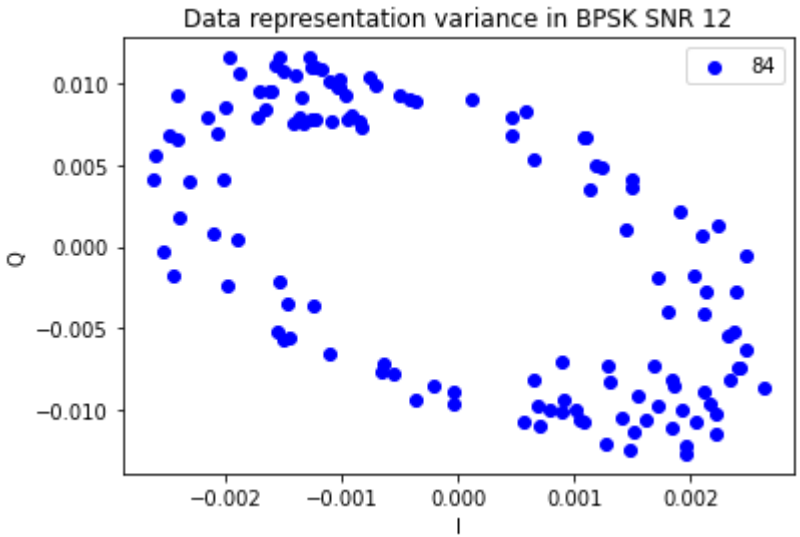

Data representation variance in BPSK SNR 12
79
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

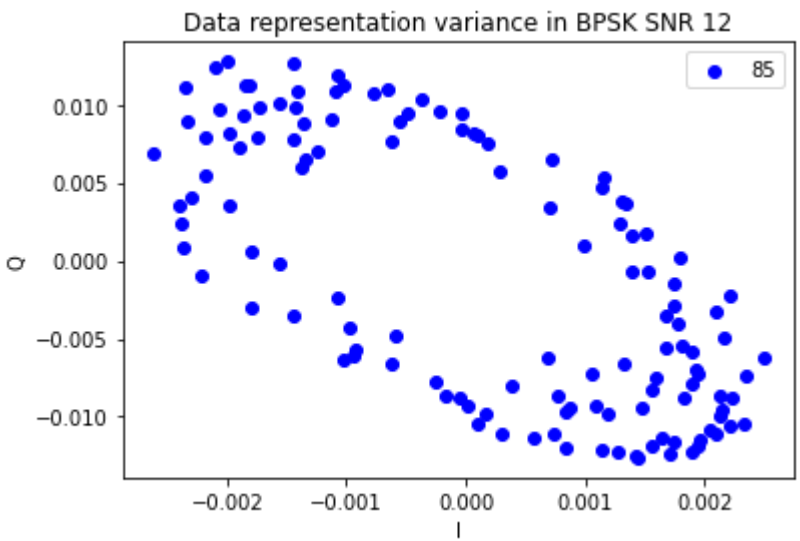

Data representation variance in BPSK SNR 12
80
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

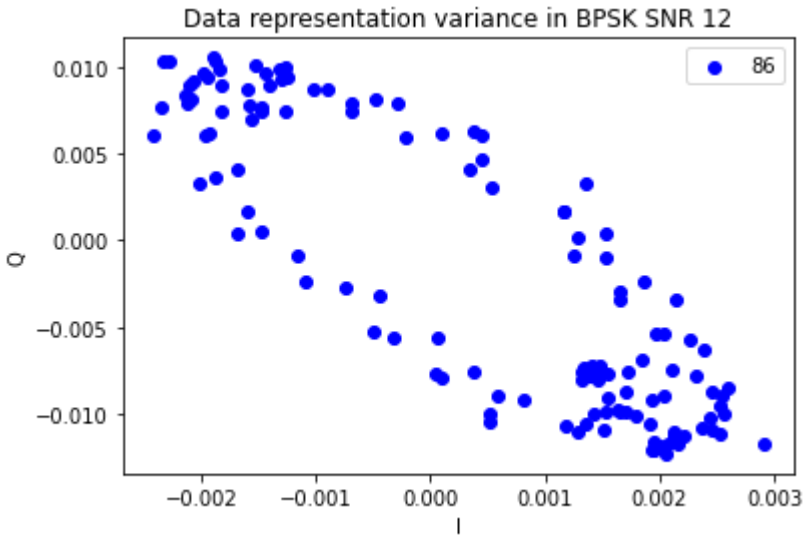

Data representation variance in BPSK SNR 12
81
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

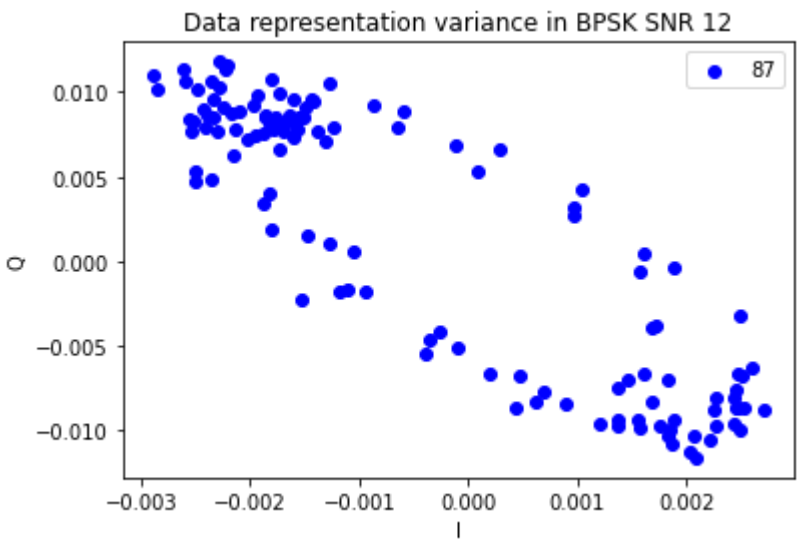

Data representation variance in BPSK SNR 12
82
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

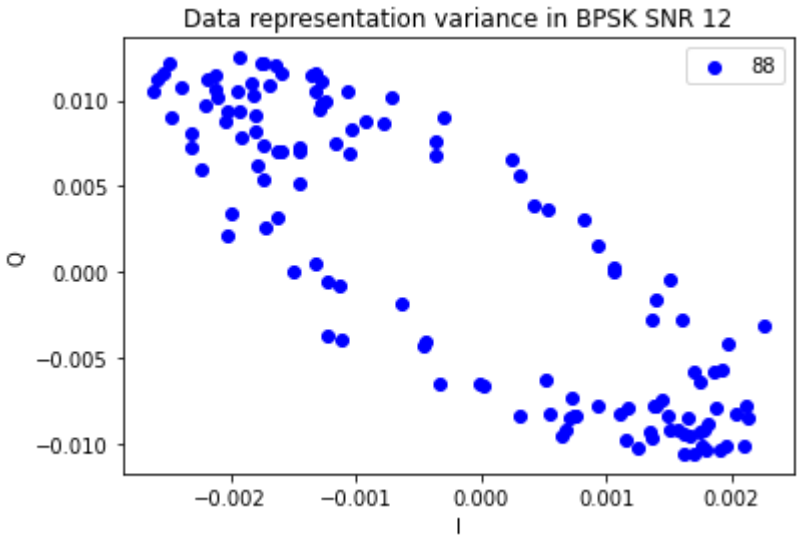

Data representation variance in BPSK SNR 12
83
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

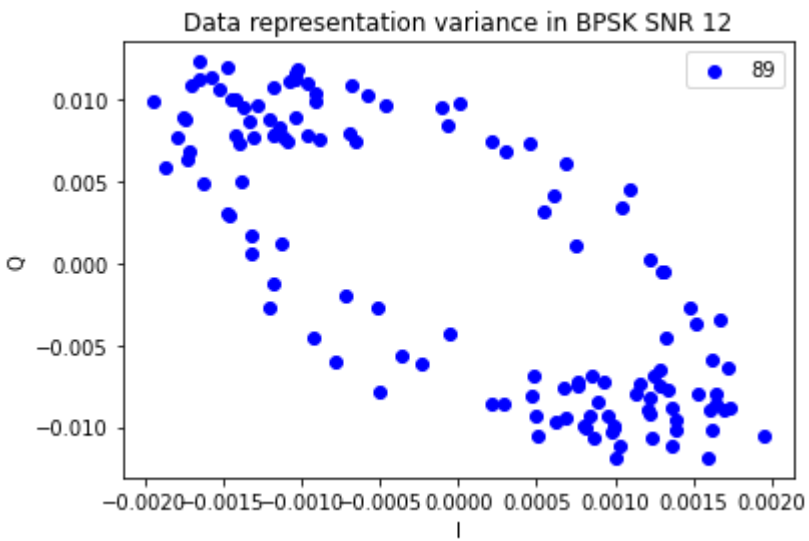

Data representation variance in BPSK SNR 12
84
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

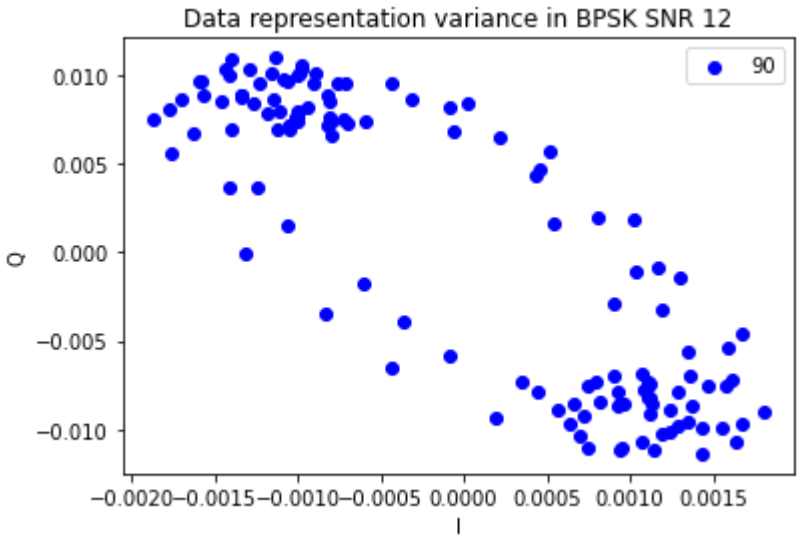

Data representation variance in BPSK SNR 12
85
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

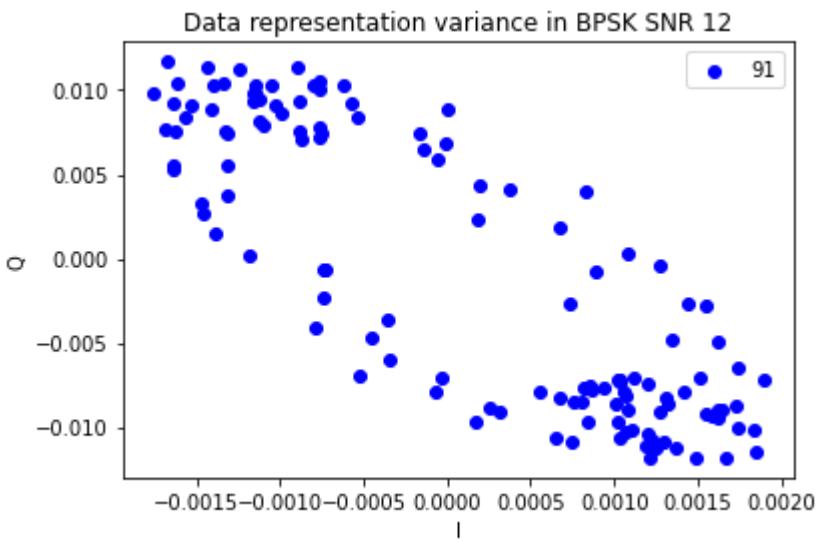

Data representation variance in BPSK SNR 12
86
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

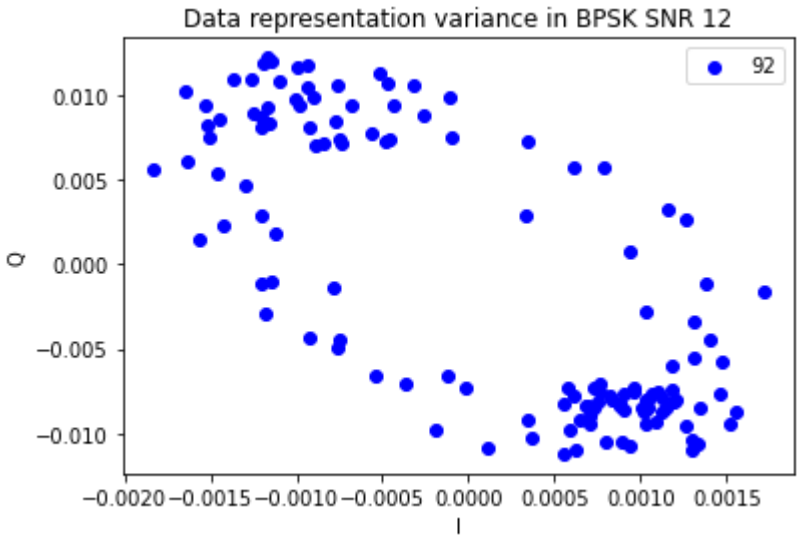

Data representation variance in BPSK SNR 12
87
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

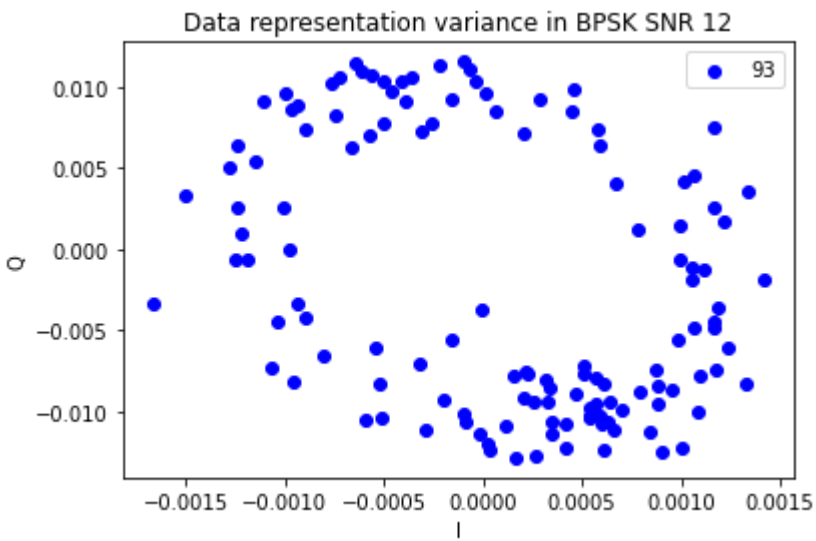

Data representation variance in BPSK SNR 12
88
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

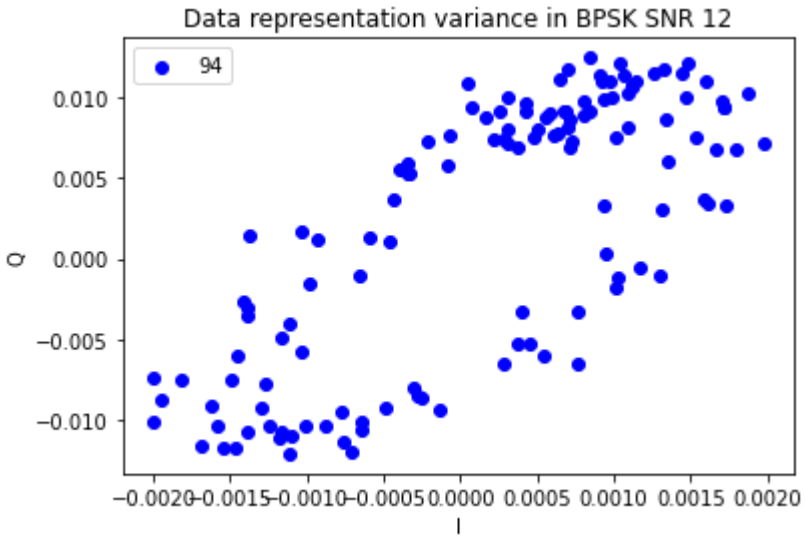

Data representation variance in BPSK SNR 12
89
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
I

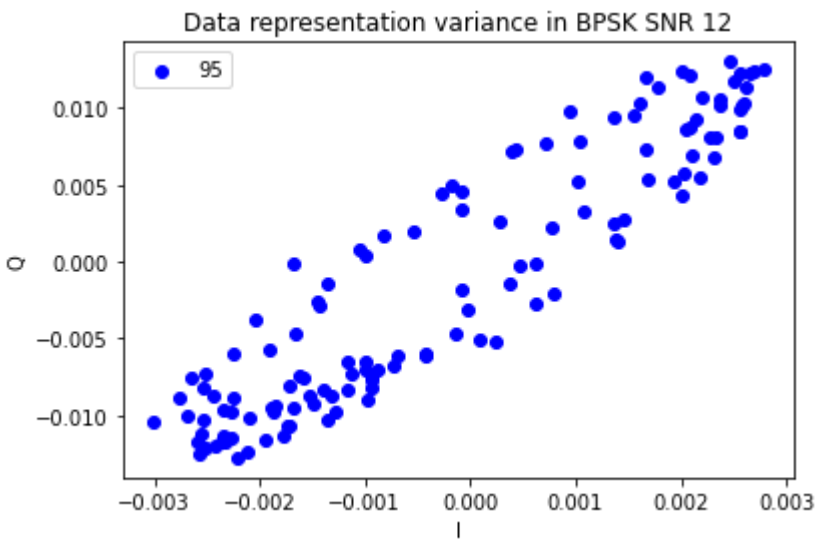

Data representation variance in BPSK SNR 12
90
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

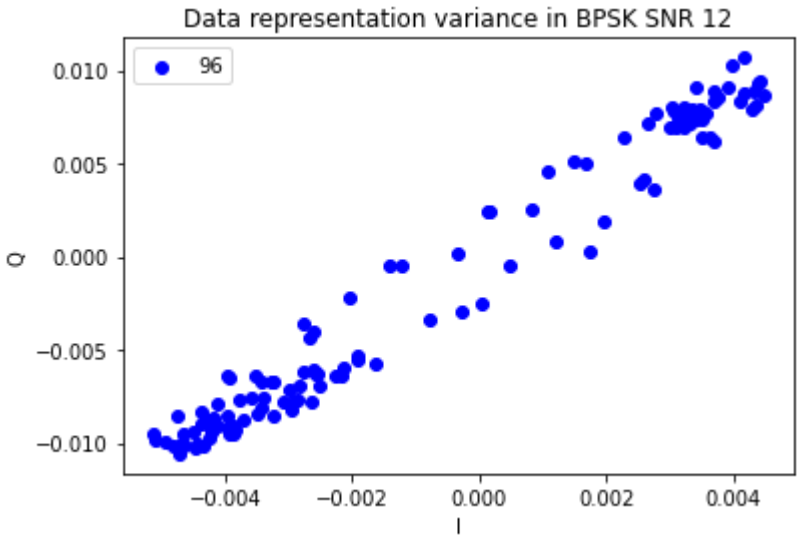

Data representation variance in BPSK SNR 12
91
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

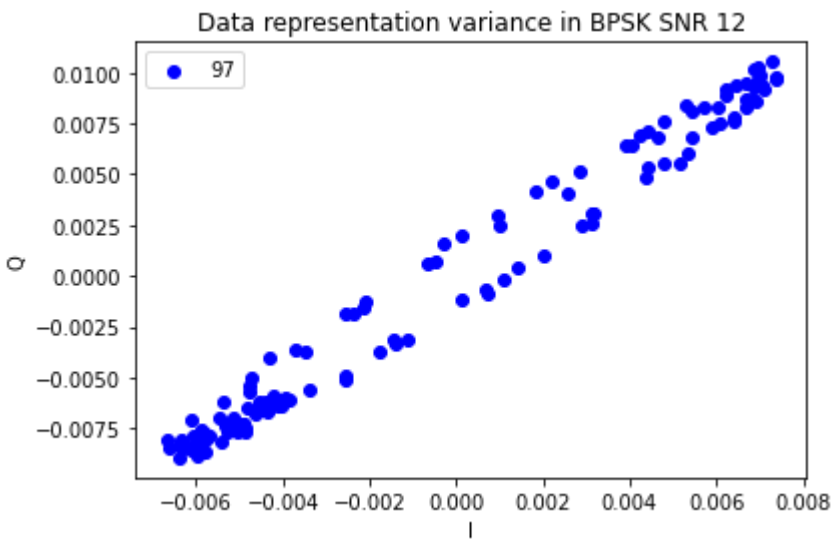

Data representation variance in BPSK SNR 12
92
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

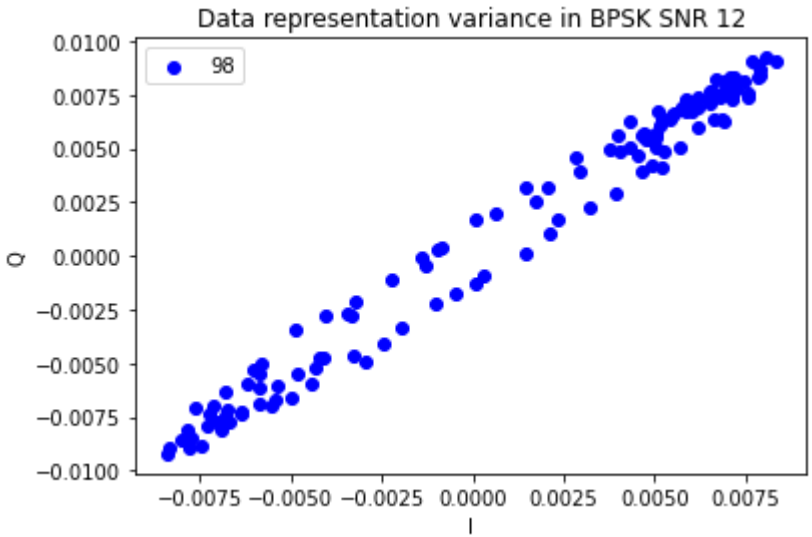

Data representation variance in BPSK SNR 12
93
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

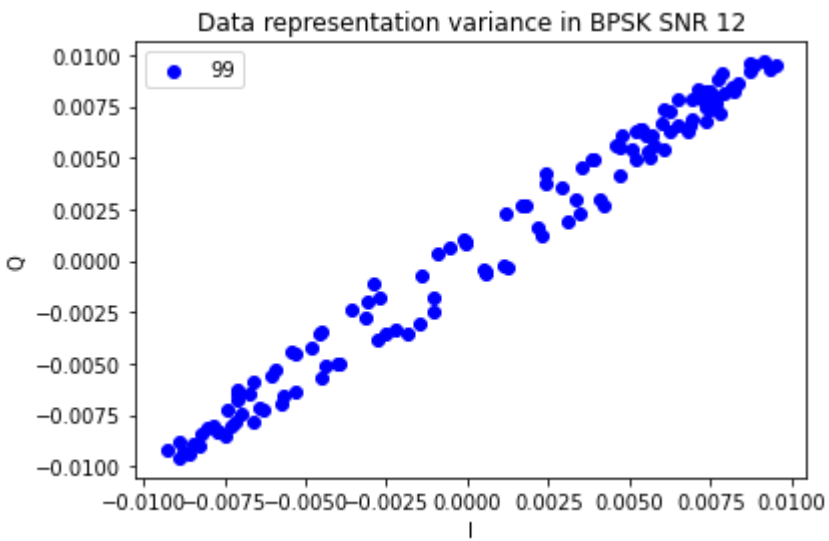

Data representation variance in BPSK SNR 12
94
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

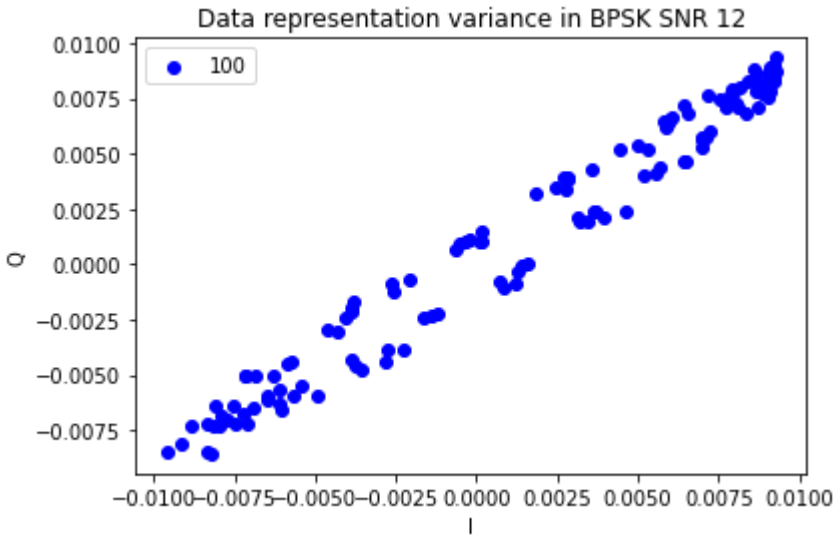

Data representation variance in BPSK SNR 12
95
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

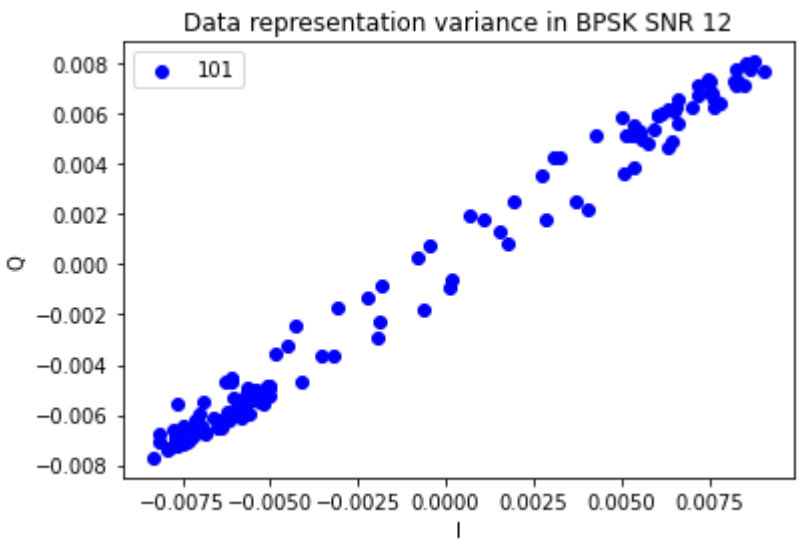

Data representation variance in BPSK SNR 12
96
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

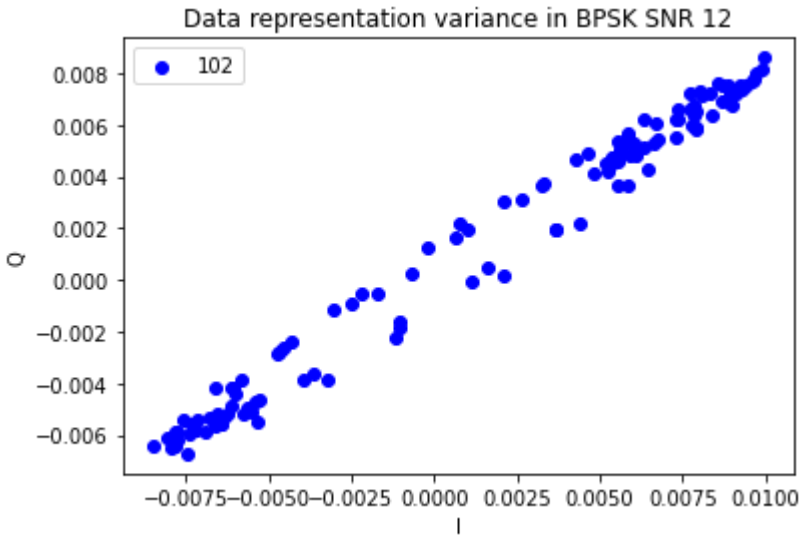

Data representation variance in BPSK SNR 12
97
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I

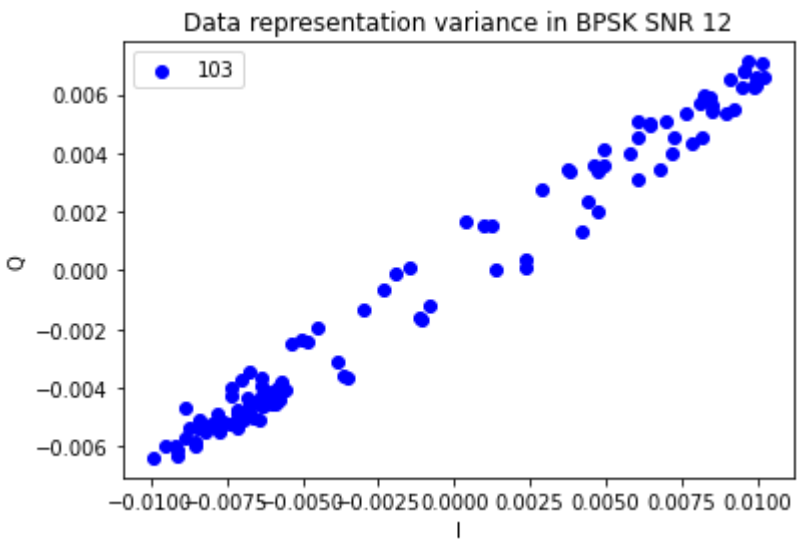

Data representation variance in BPSK SNR 12
98
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

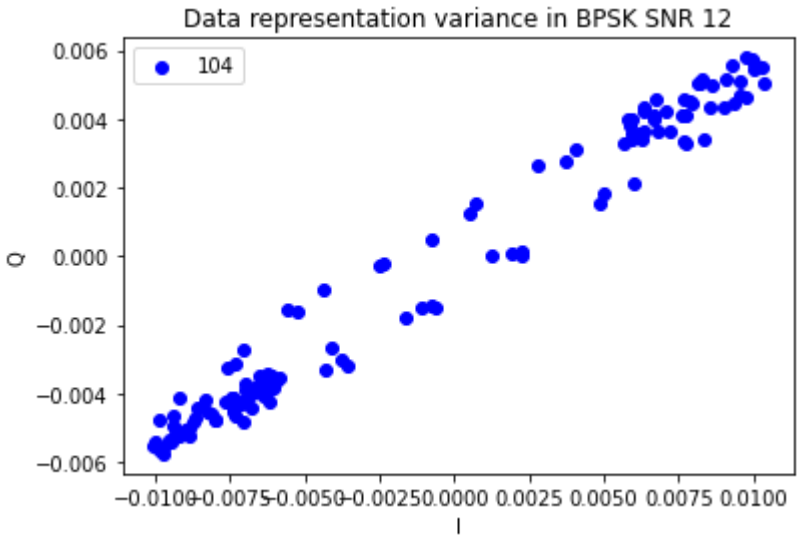

Data representation variance in BPSK SNR 12
99
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0100−0.0075−0.0050−0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

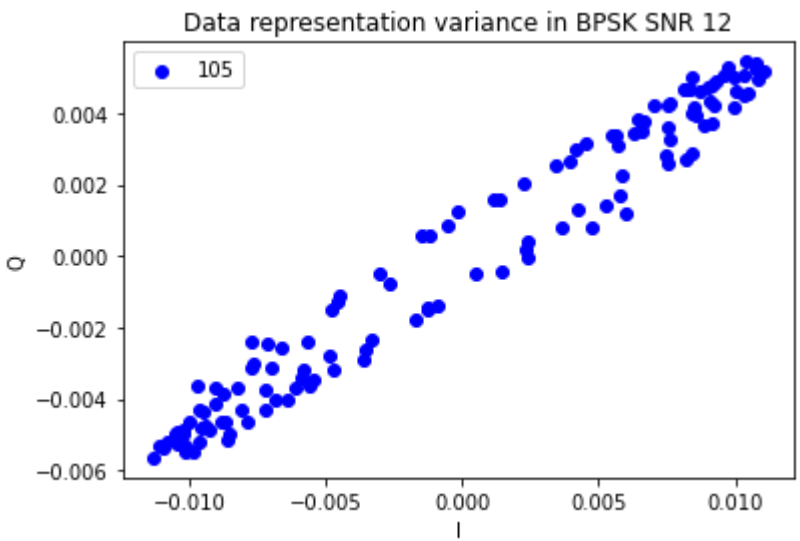

Data representation variance in BPSK SNR 12
100
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

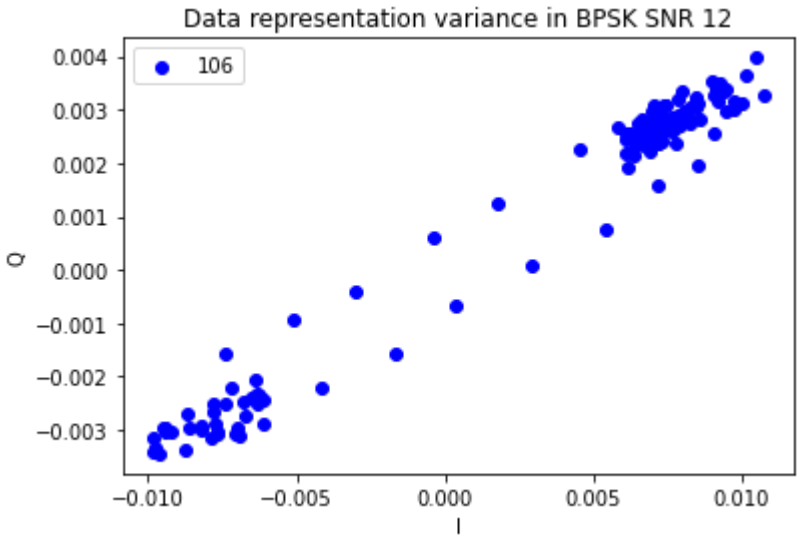

Data representation variance in BPSK SNR 12
101
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

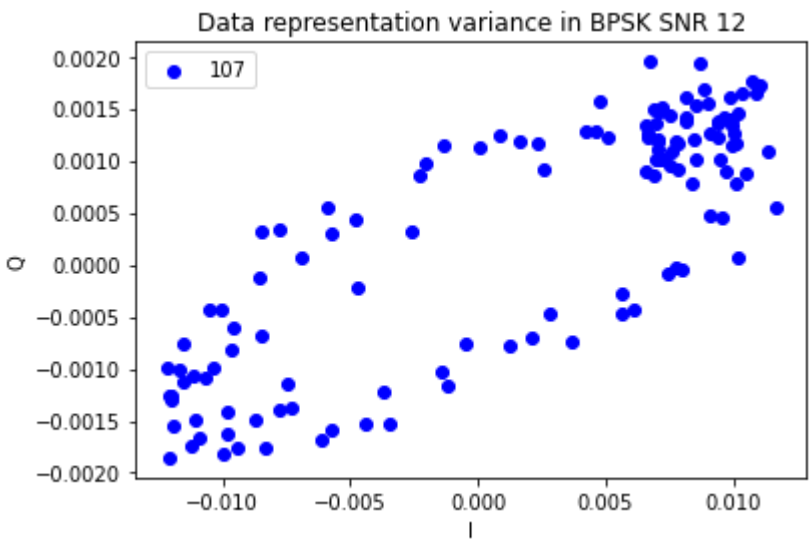

Data representation variance in BPSK SNR 12
102
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

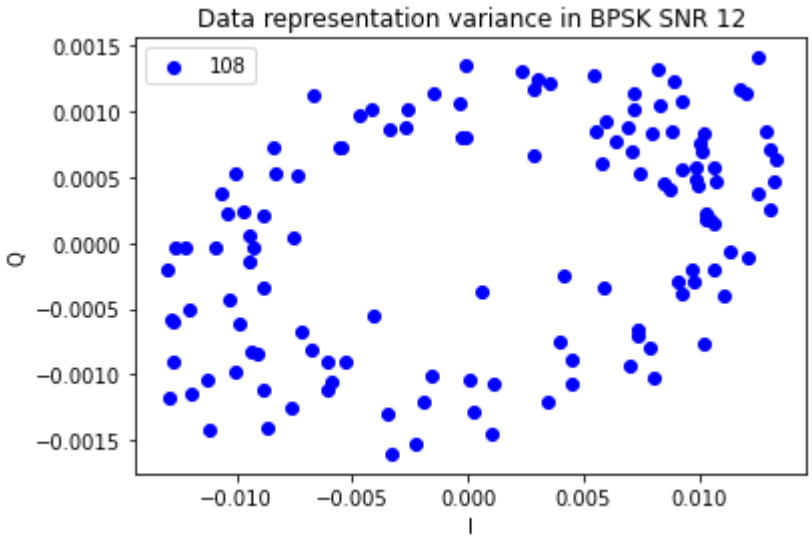

Data representation variance in BPSK SNR 12
103
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

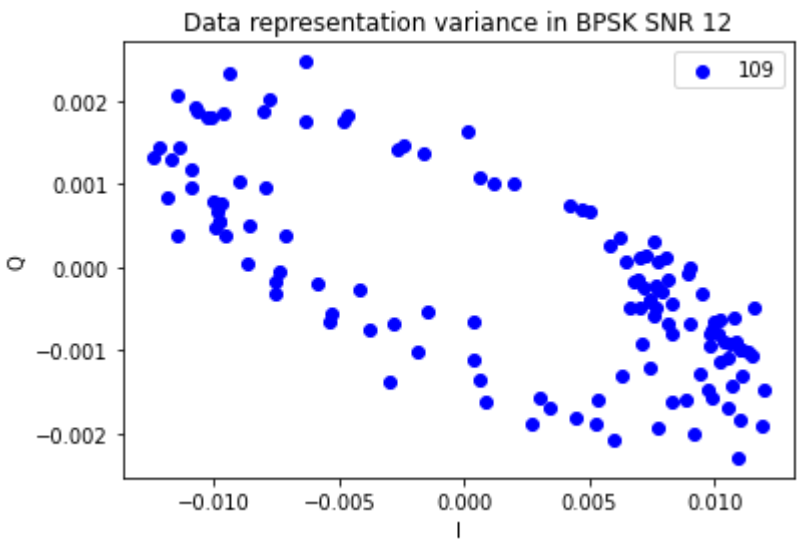

Data representation variance in BPSK SNR 12
104
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

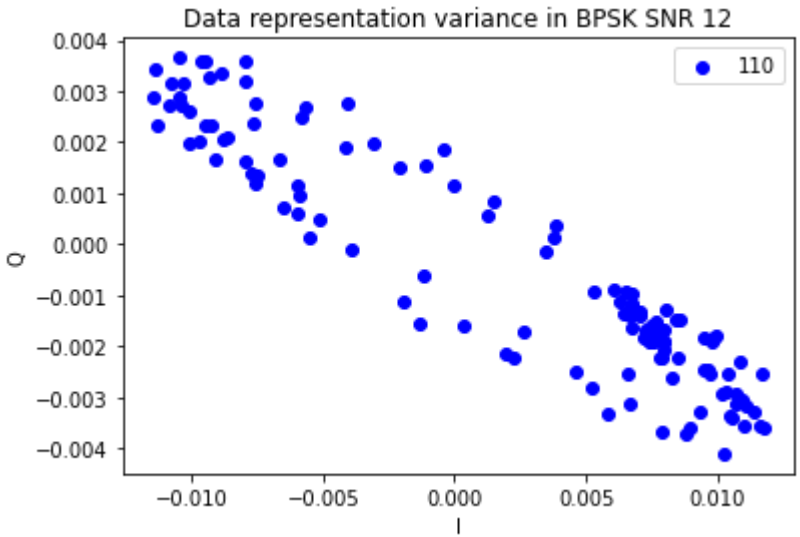

Data representation variance in BPSK SNR 12
105
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

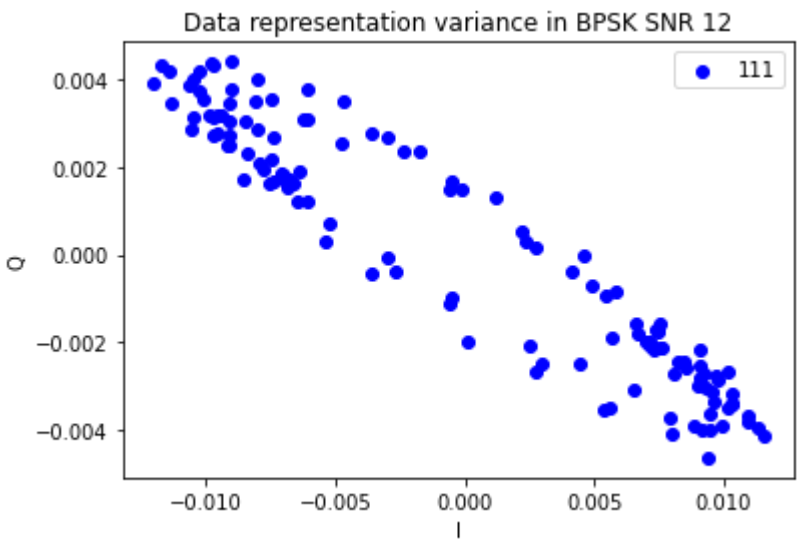

Data representation variance in BPSK SNR 12
106
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

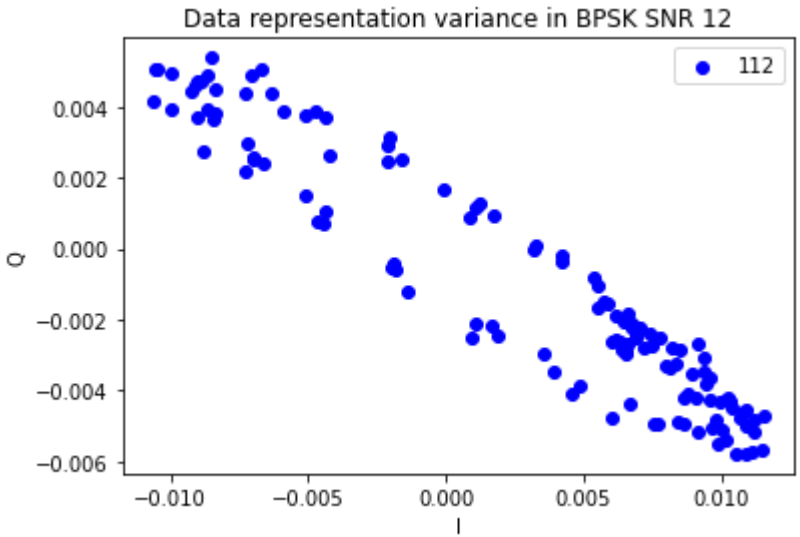

Data representation variance in BPSK SNR 12
107
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I

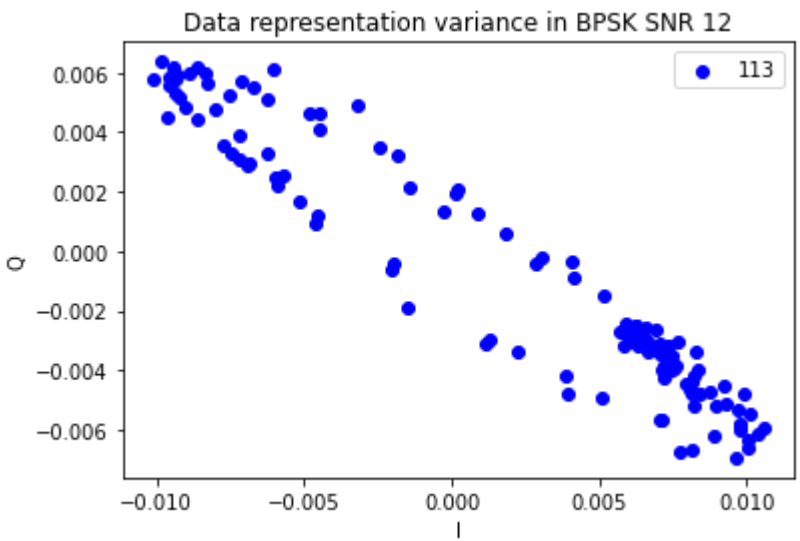

Data representation variance in BPSK SNR 12
108
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

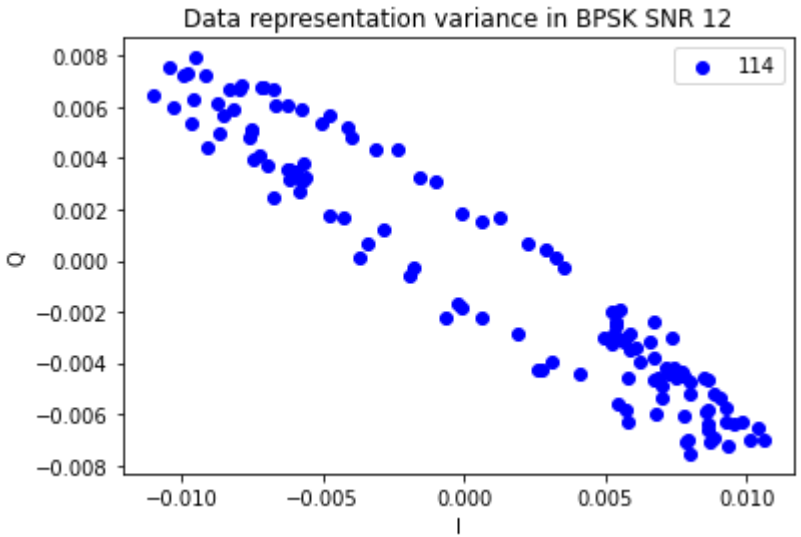

Data representation variance in BPSK SNR 12
109
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

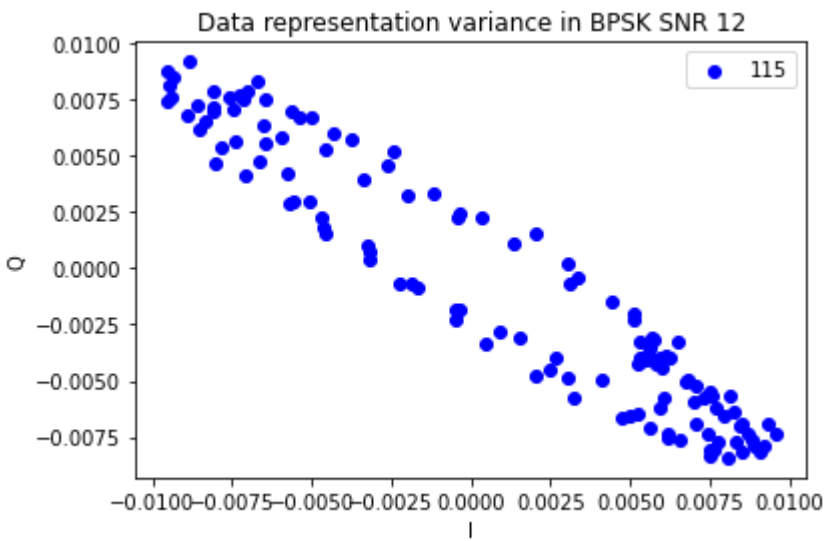

Data representation variance in BPSK SNR 12
110
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
111
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
112
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
113
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
114
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
115
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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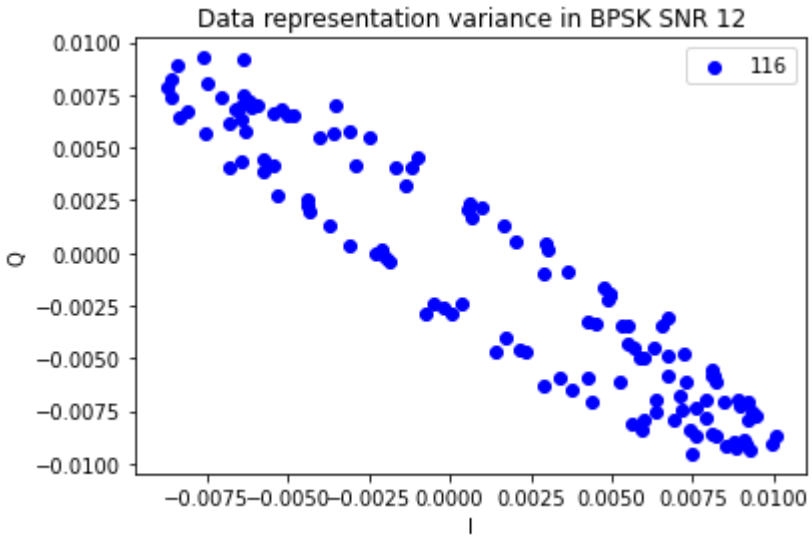
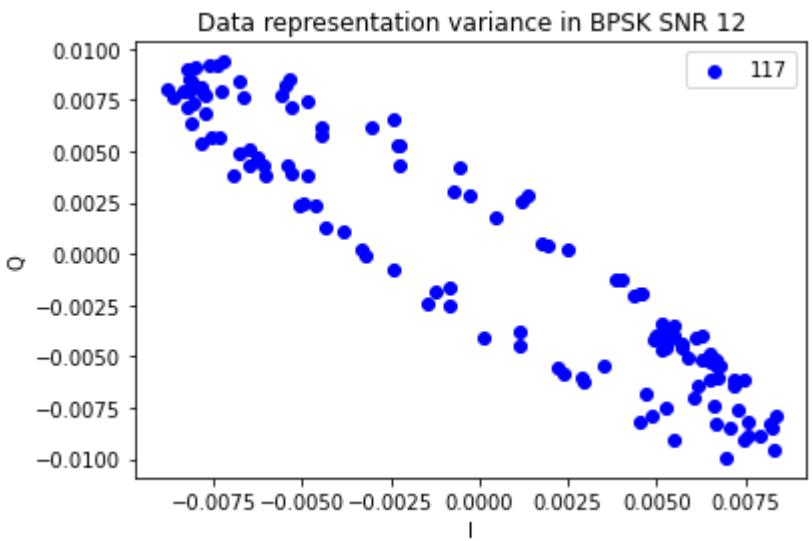
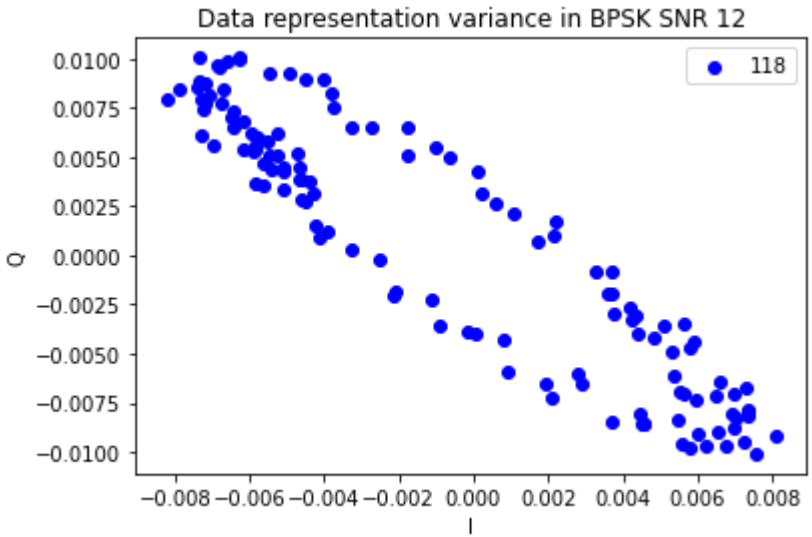
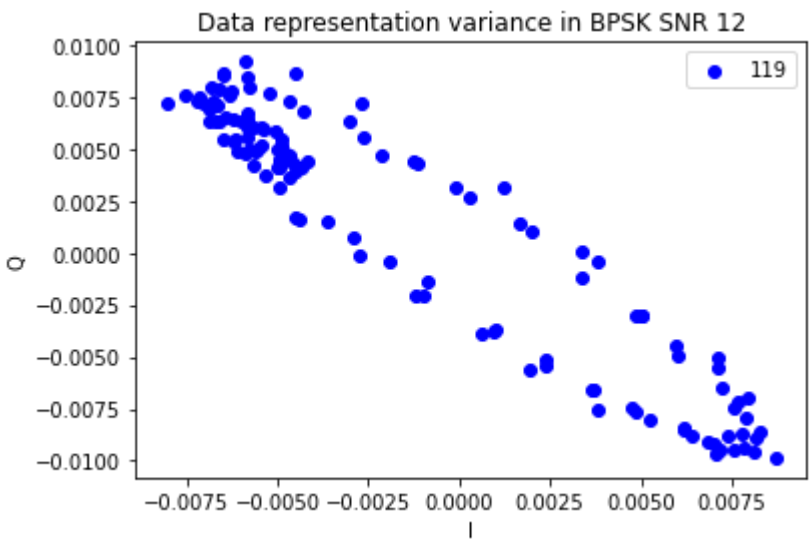
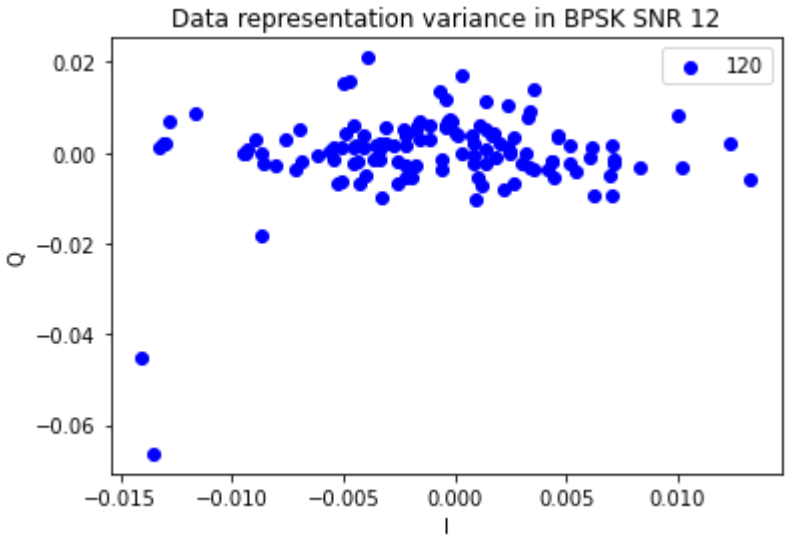
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

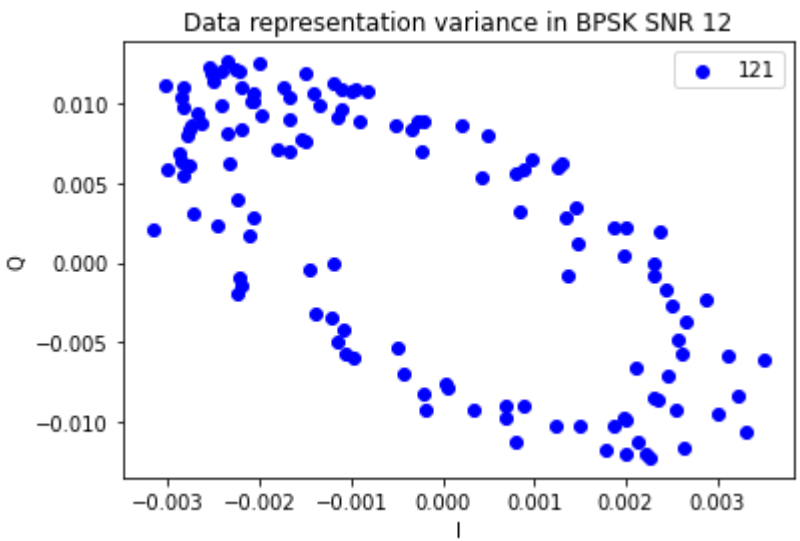

Data representation variance in BPSK SNR 12
116
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

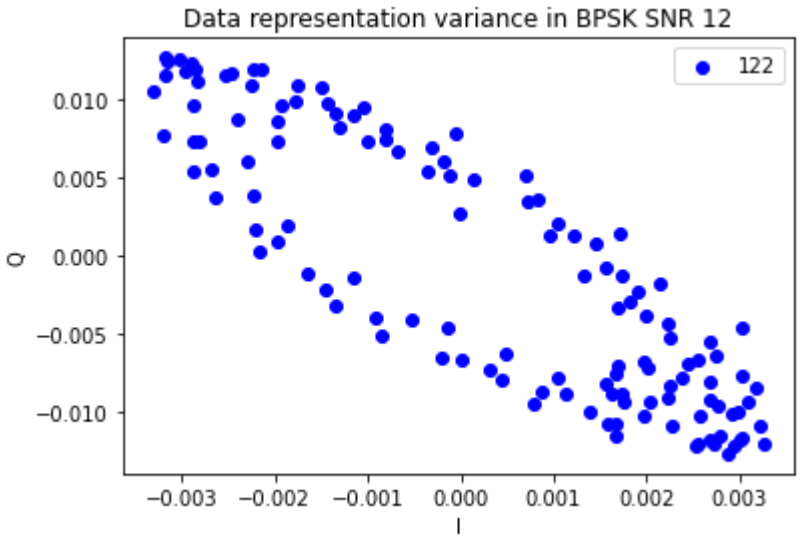

Data representation variance in BPSK SNR 12
117
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

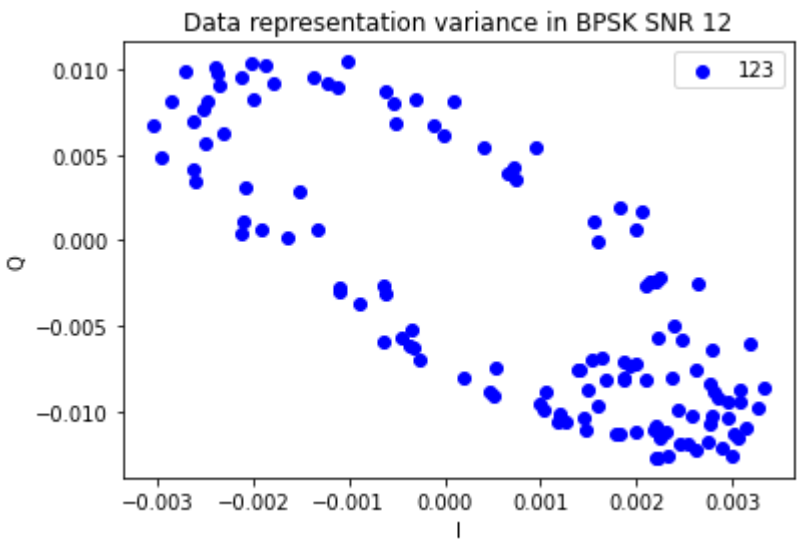

Data representation variance in BPSK SNR 12
118
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

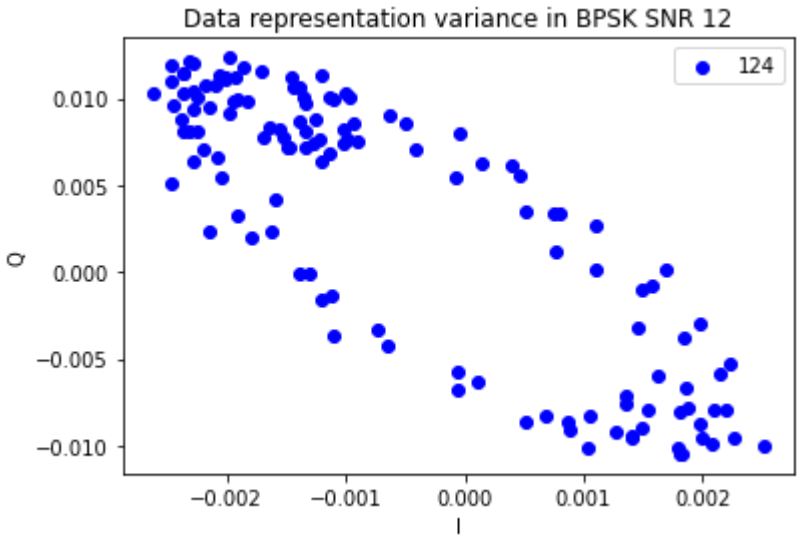

Data representation variance in BPSK SNR 12
119
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

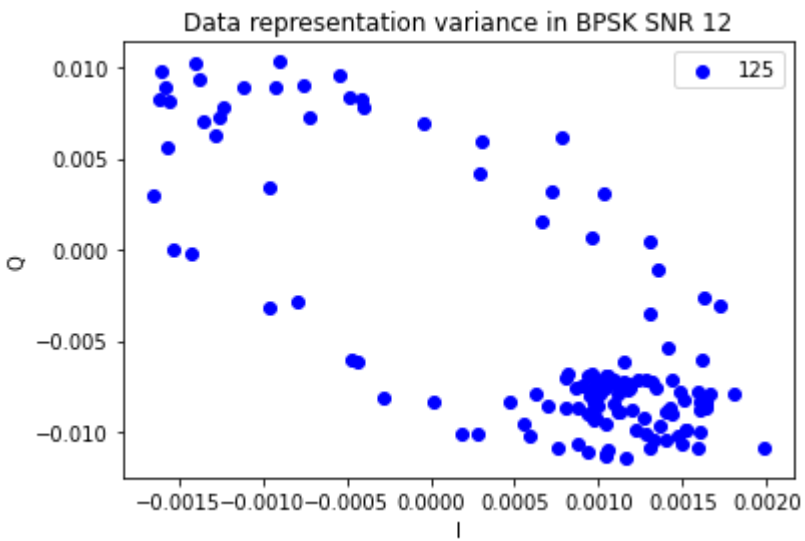

Data representation variance in BPSK SNR 12
120
0.02
0.00
−0.02
−0.04
−0.06
Q
−0.015
−0.010
−0.005
0.000
0.005
0.010
I

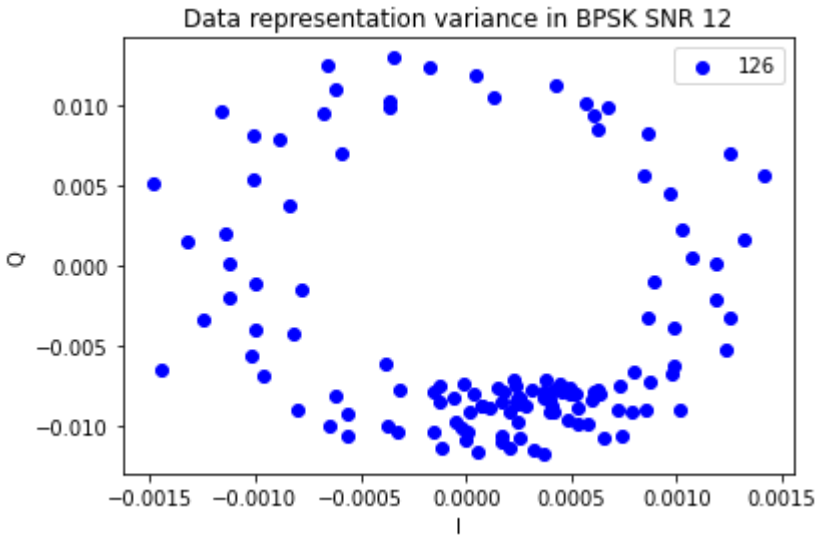

Data representation variance in BPSK SNR 12
121
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

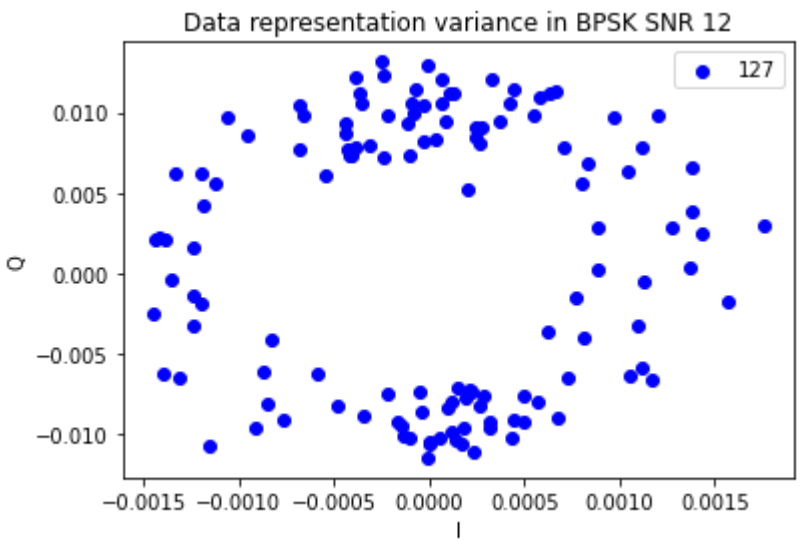

Data representation variance in BPSK SNR 12
122
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

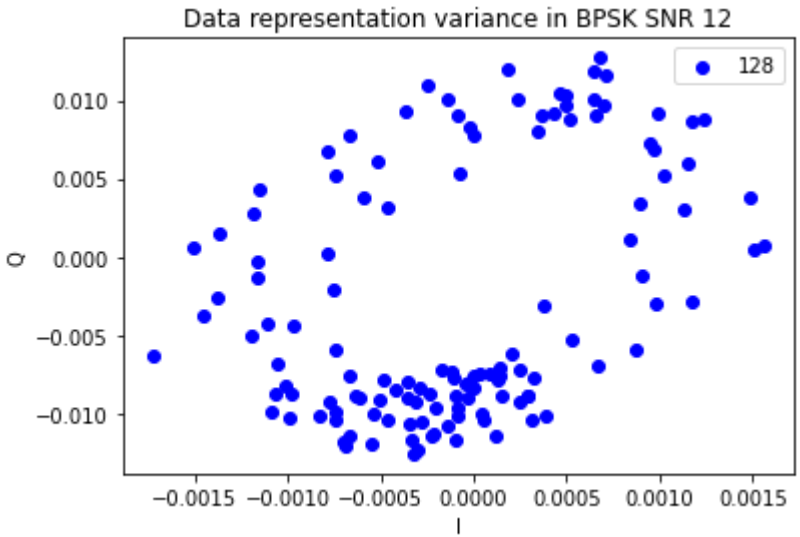

Data representation variance in BPSK SNR 12
123
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

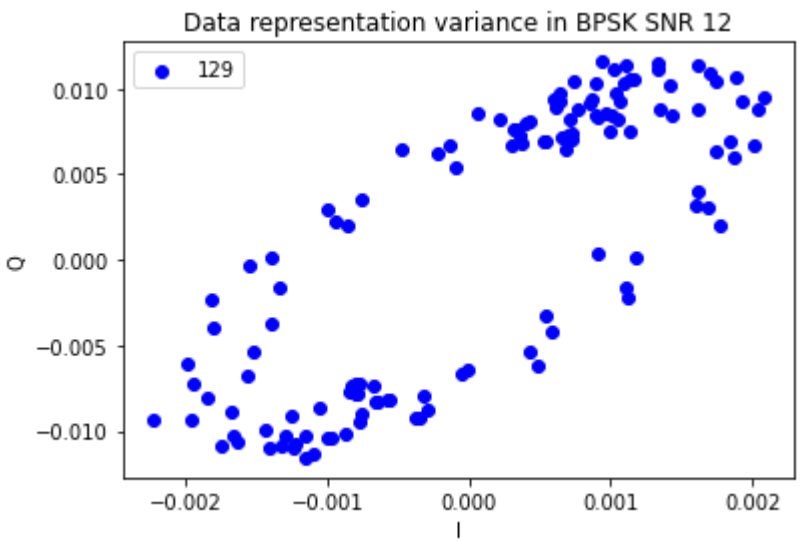

Data representation variance in BPSK SNR 12
124
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

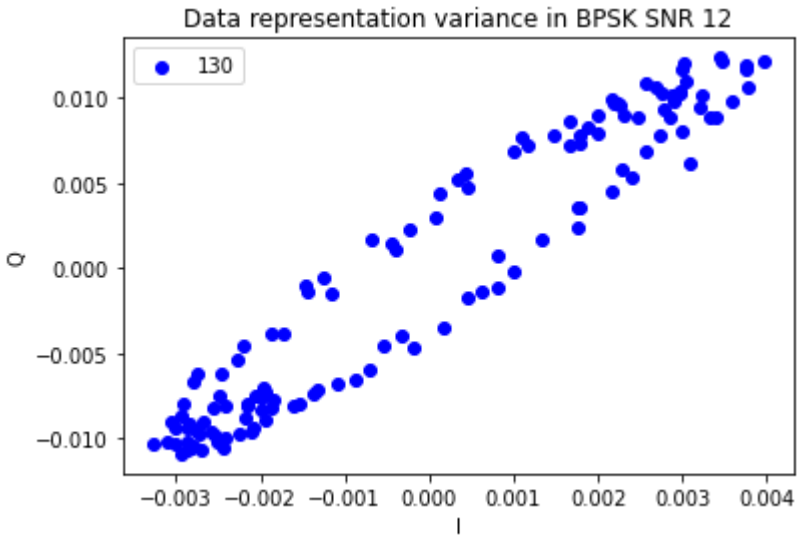

Data representation variance in BPSK SNR 12
125
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
I

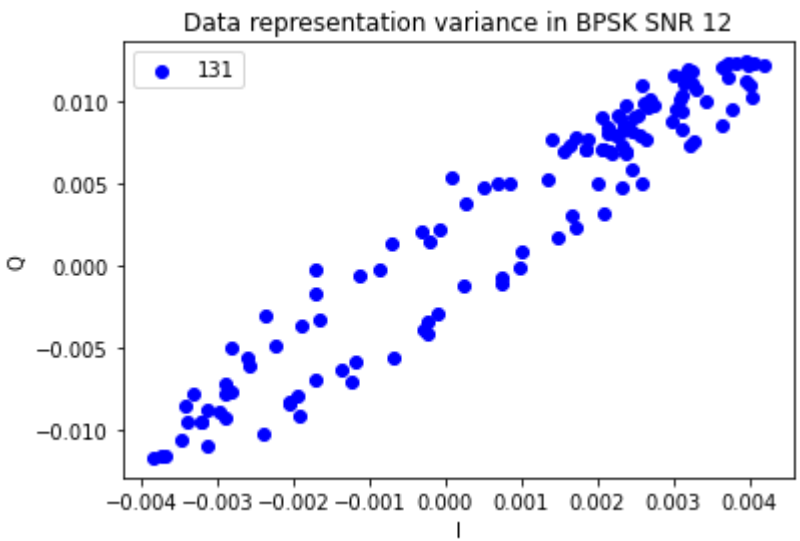

Data representation variance in BPSK SNR 12
126
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

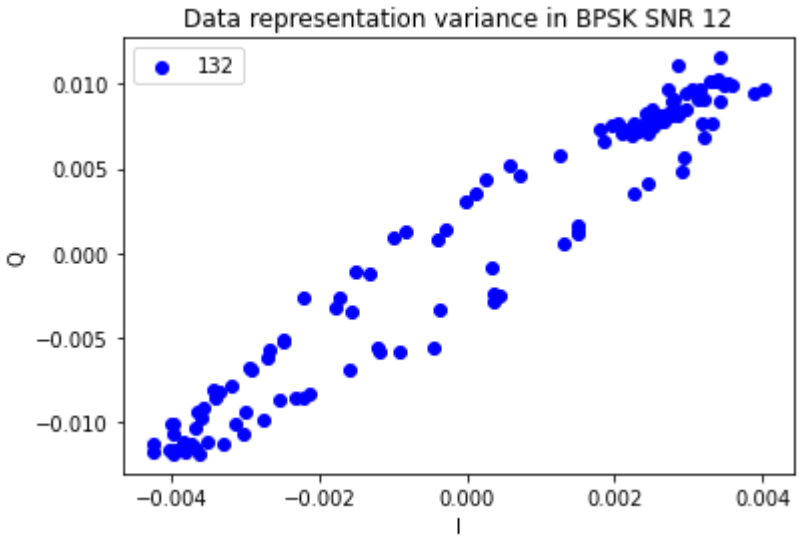

Data representation variance in BPSK SNR 12
127
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

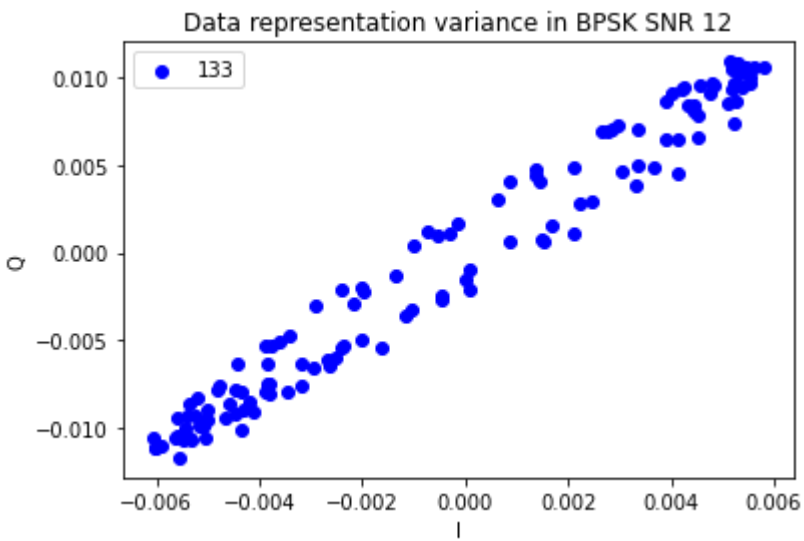

Data representation variance in BPSK SNR 12
128
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

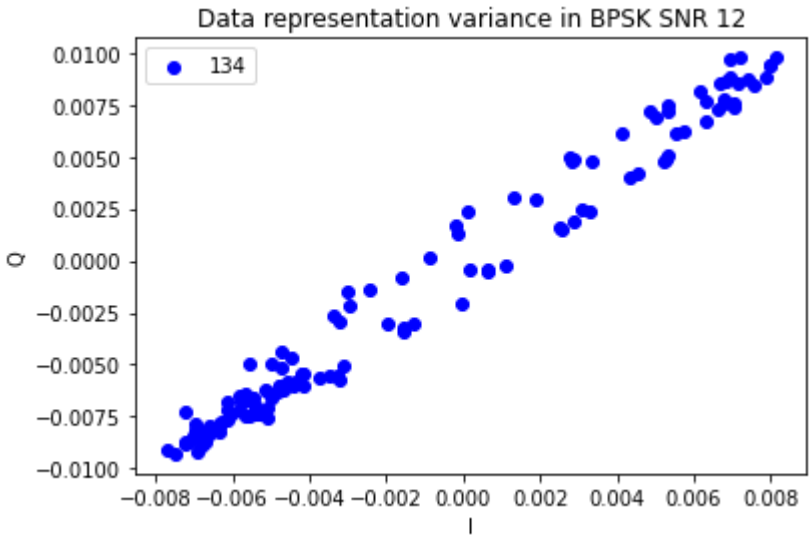

Data representation variance in BPSK SNR 12
129
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

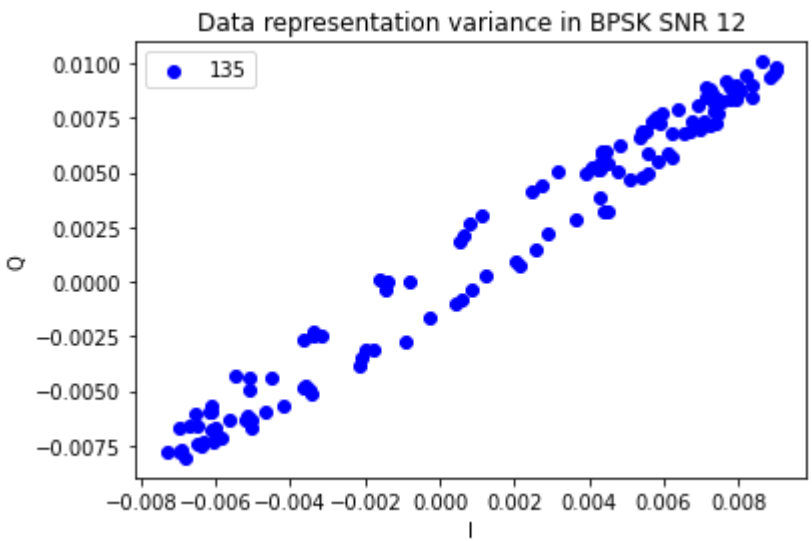

Data representation variance in BPSK SNR 12
130
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

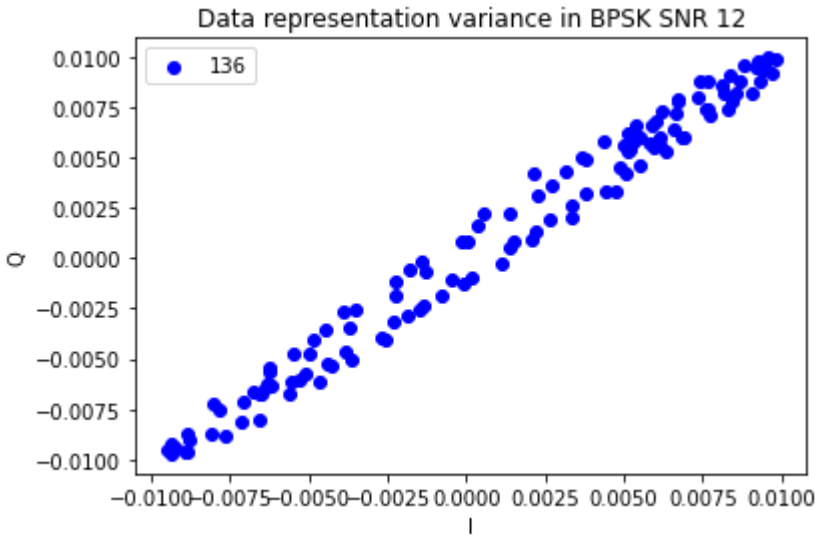

Data representation variance in BPSK SNR 12
131
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
132
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
133
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
134
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
135
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
136
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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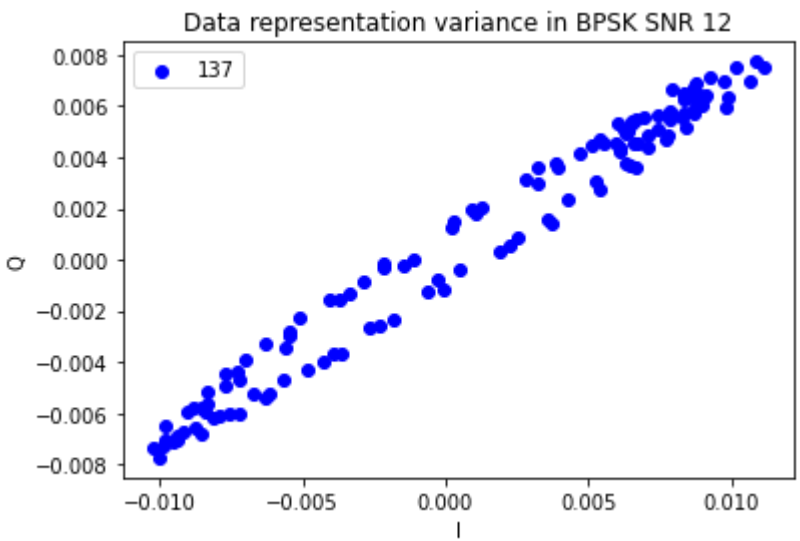
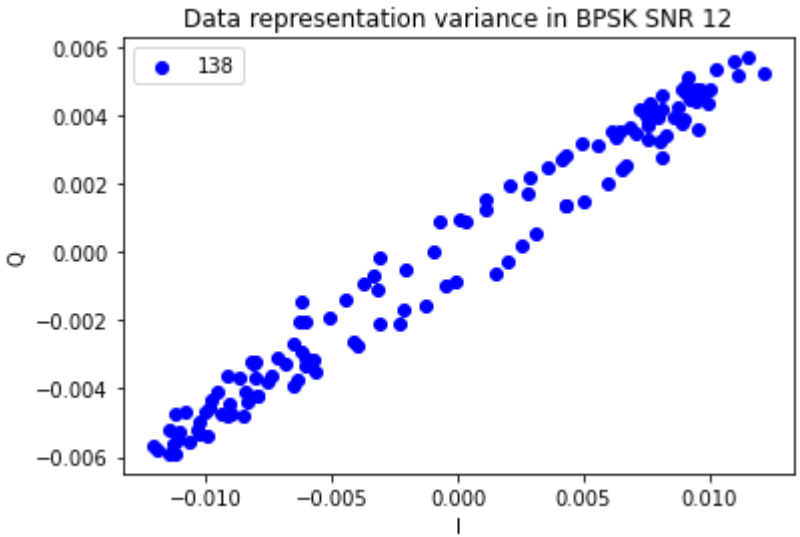
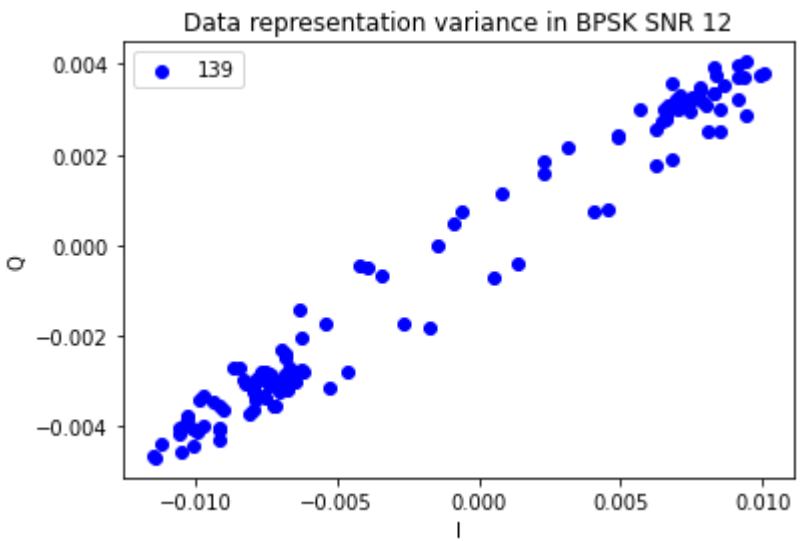
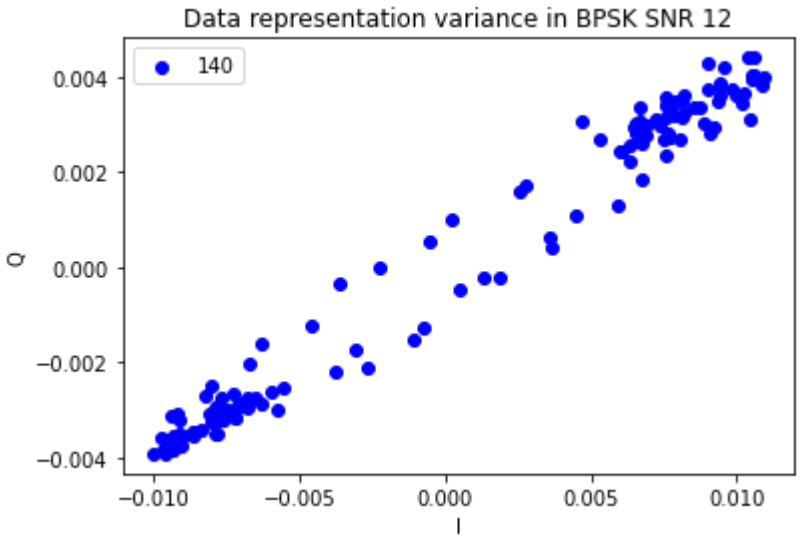
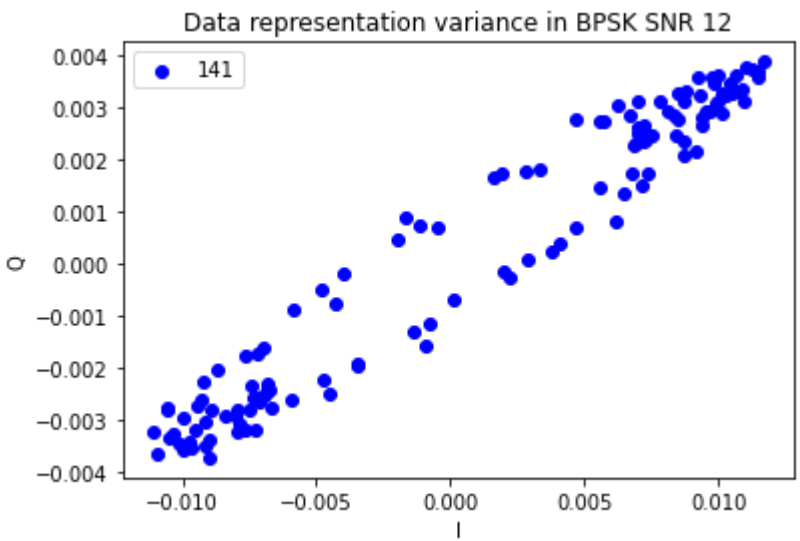
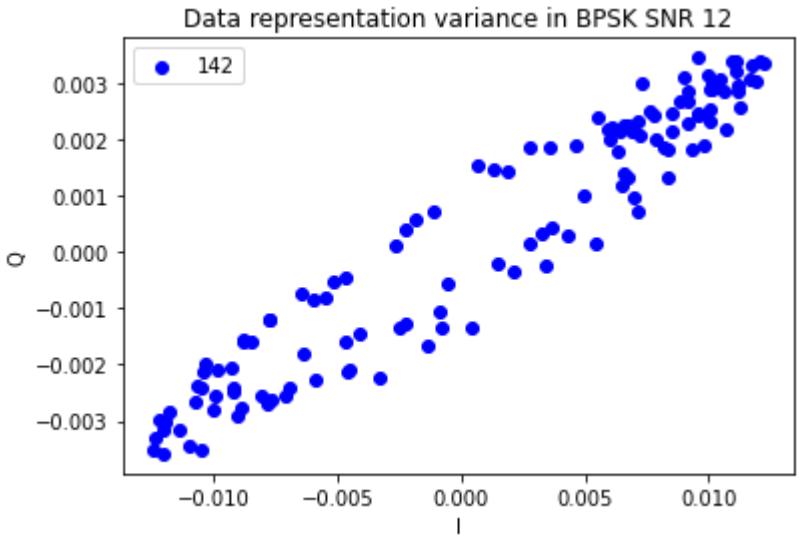

Data representation variance in BPSK SNR 12
137
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010 −0.005 0.000 0.005 0.010
I

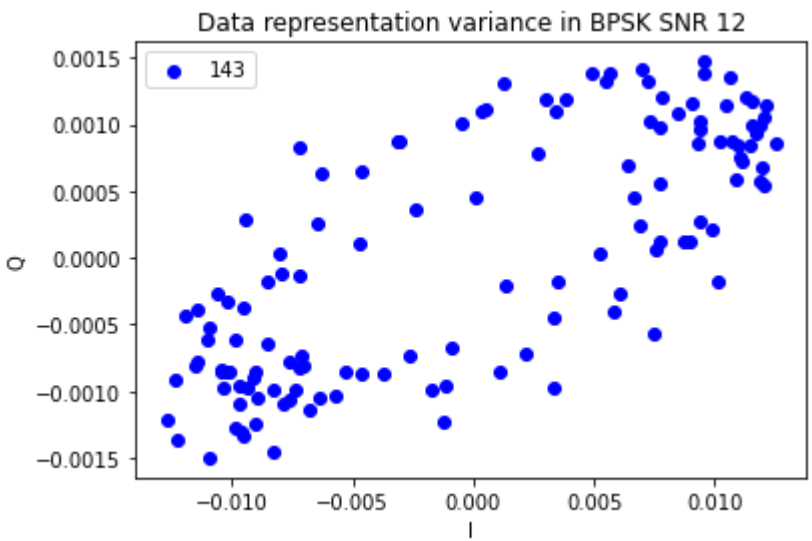

Data representation variance in BPSK SNR 12
138
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

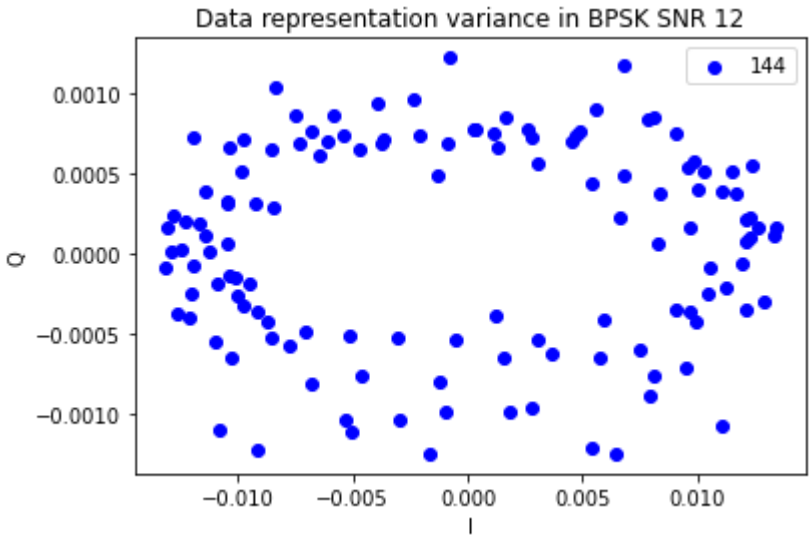

Data representation variance in BPSK SNR 12
139
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

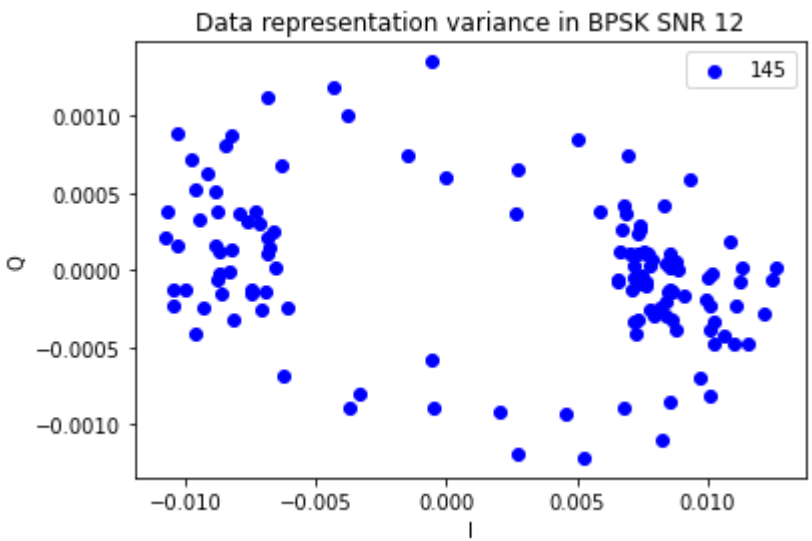

Data representation variance in BPSK SNR 12
140
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

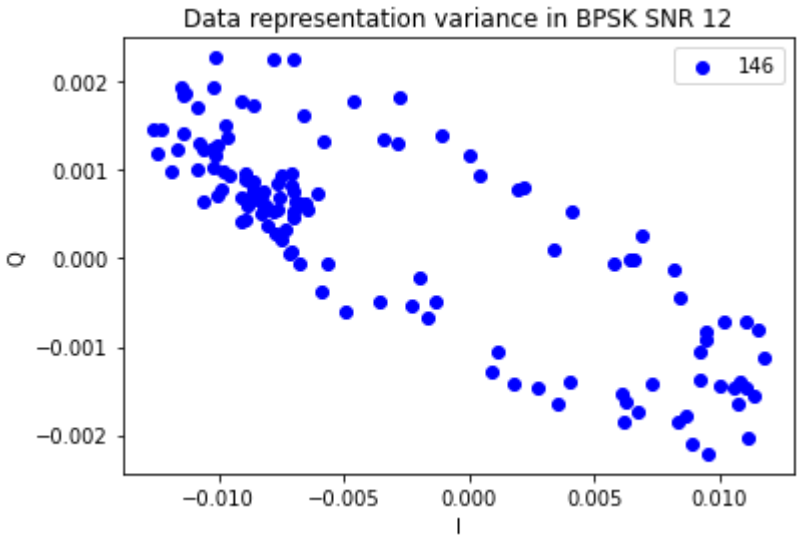

Data representation variance in BPSK SNR 12
141
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

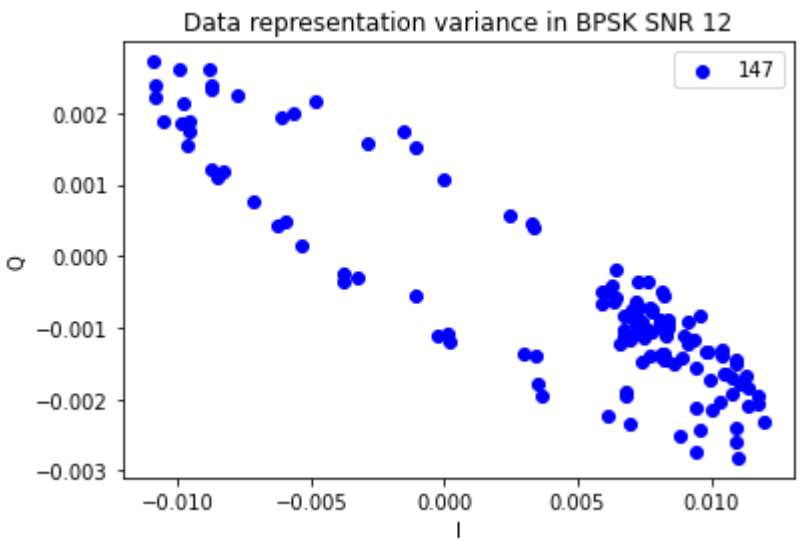

Data representation variance in BPSK SNR 12
142
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

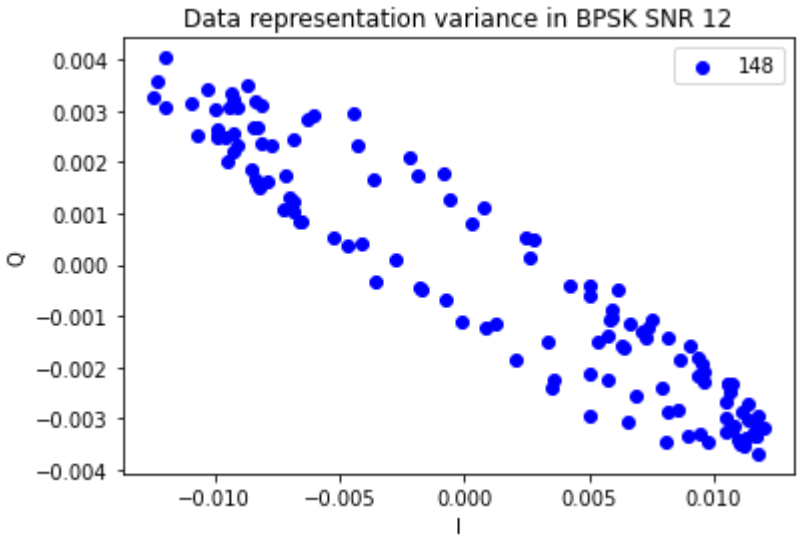

Data representation variance in BPSK SNR 12
143
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

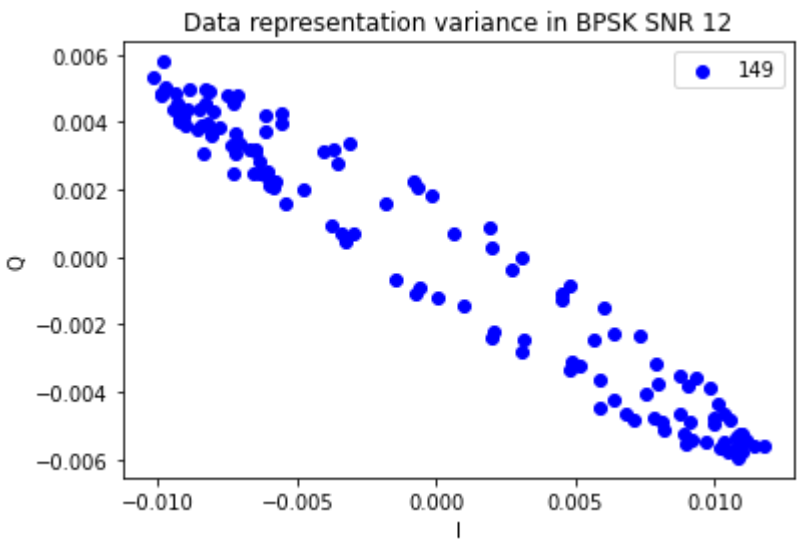

Data representation variance in BPSK SNR 12
144
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

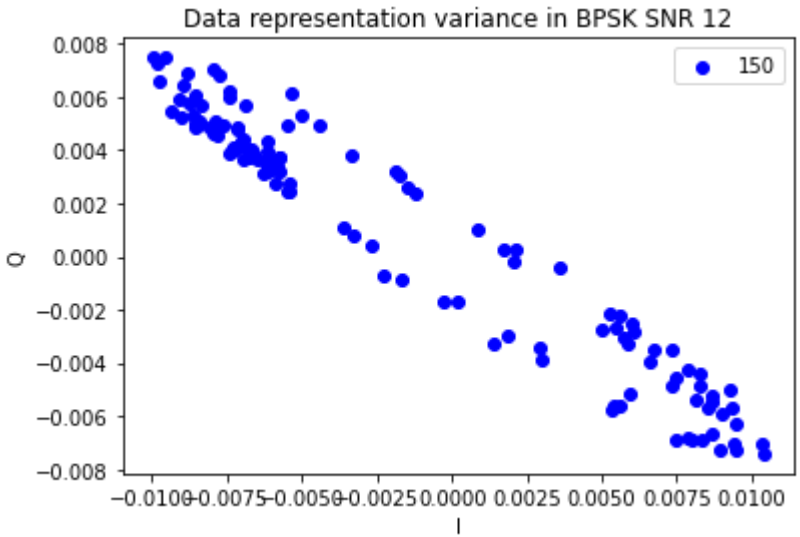

Data representation variance in BPSK SNR 12
145
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

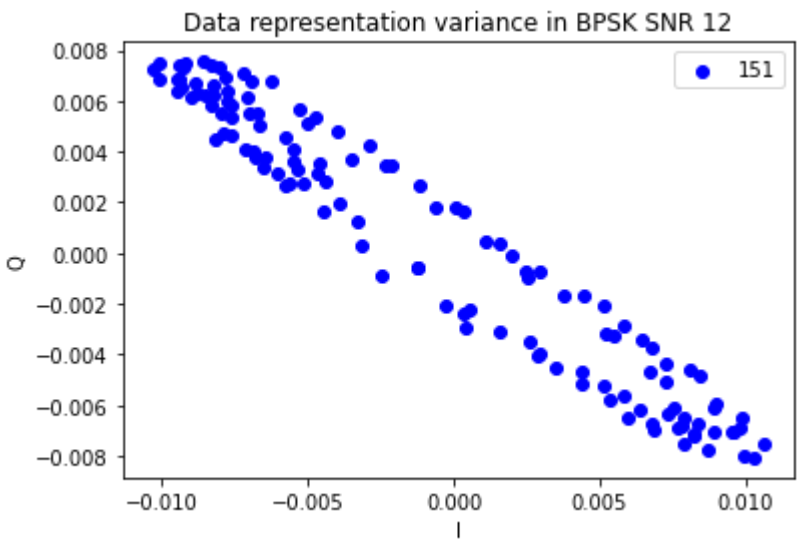

Data representation variance in BPSK SNR 12
146
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

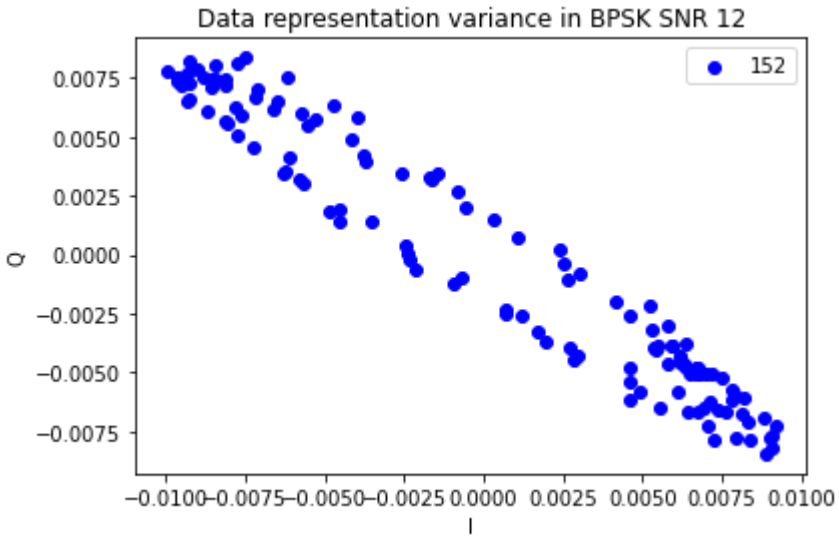

Data representation variance in BPSK SNR 12
147
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

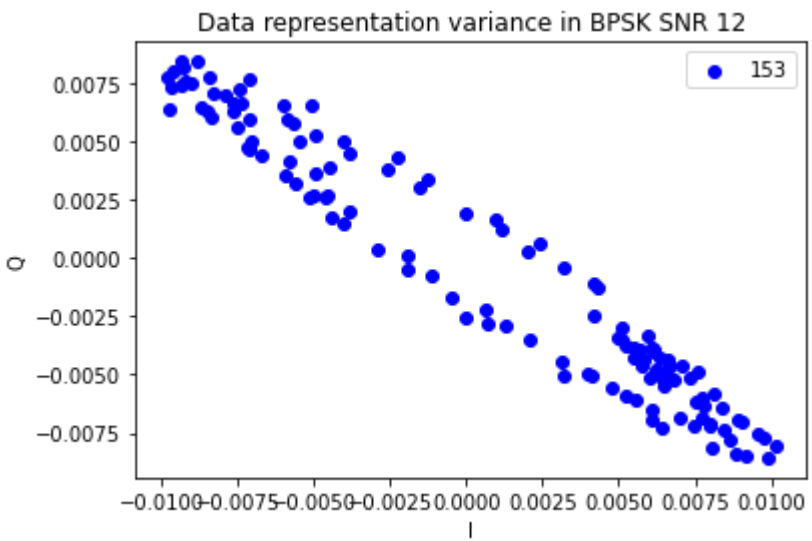

Data representation variance in BPSK SNR 12
148
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

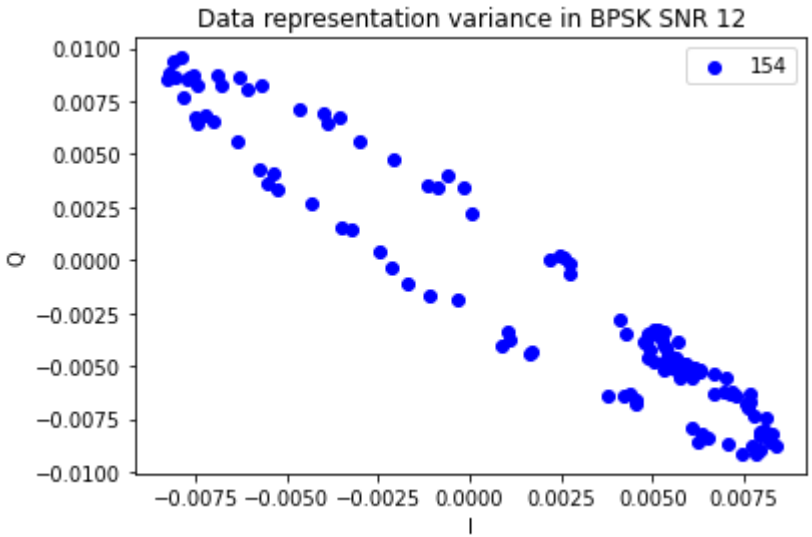

Data representation variance in BPSK SNR 12
149
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

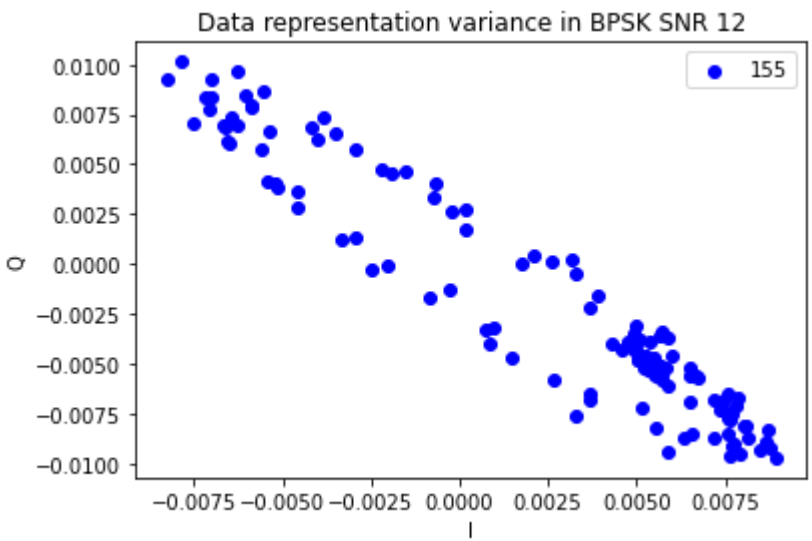

Data representation variance in BPSK SNR 12
150
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
151
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010 −0.005 0.000 0.005 0.010
I


Data representation variance in BPSK SNR 12
152
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
153
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
154
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
155
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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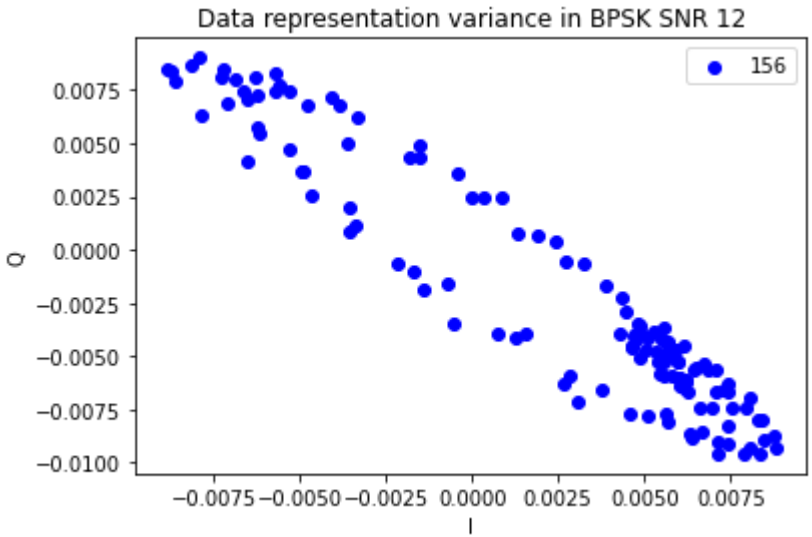
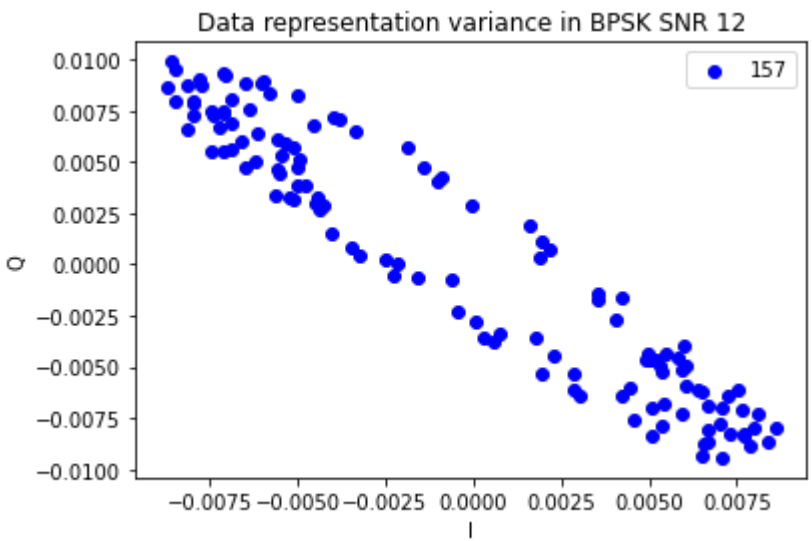
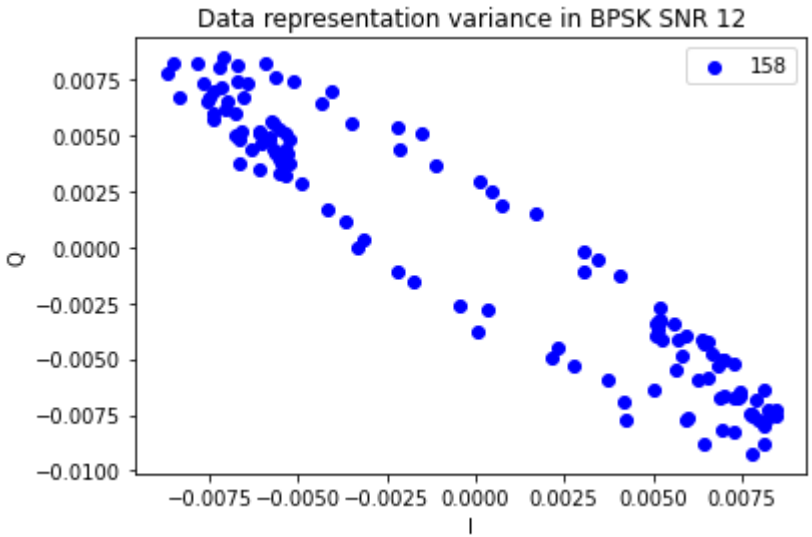

Data representation variance in BPSK SNR 12
156
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
157
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
158
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
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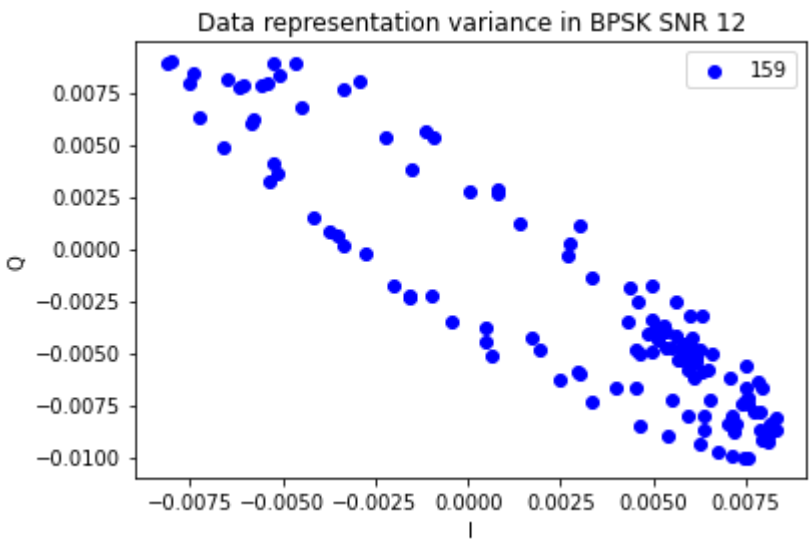
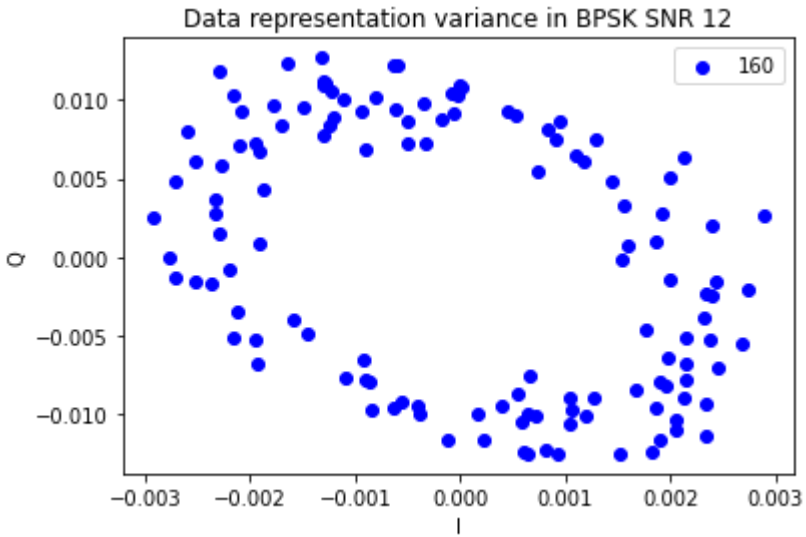
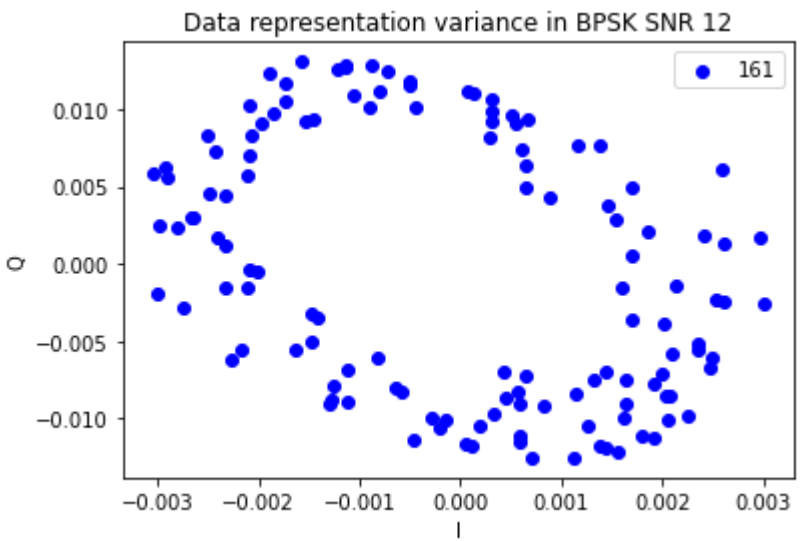
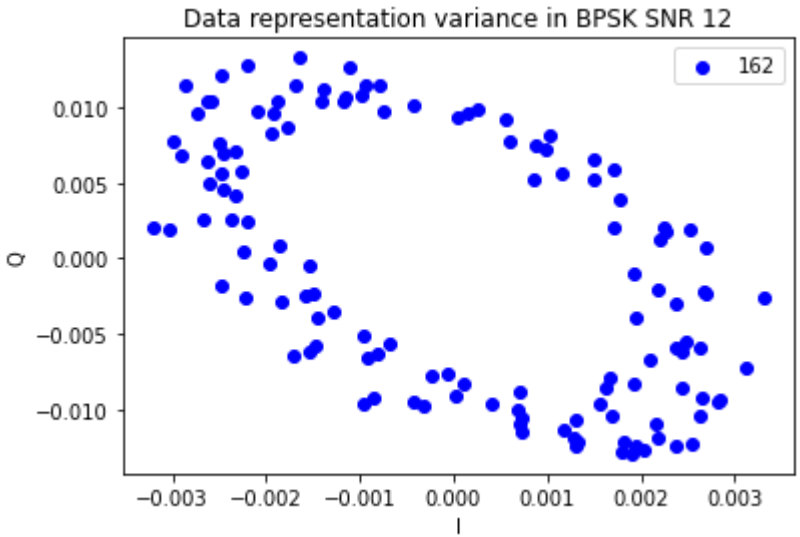
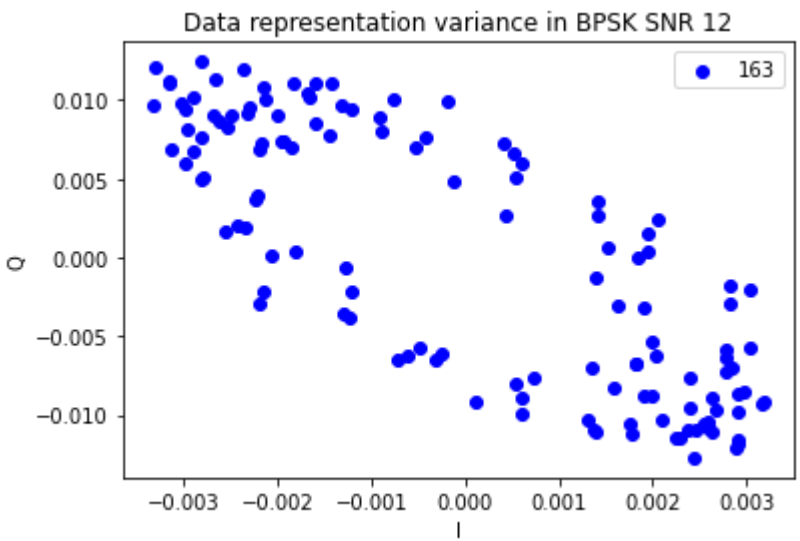
I

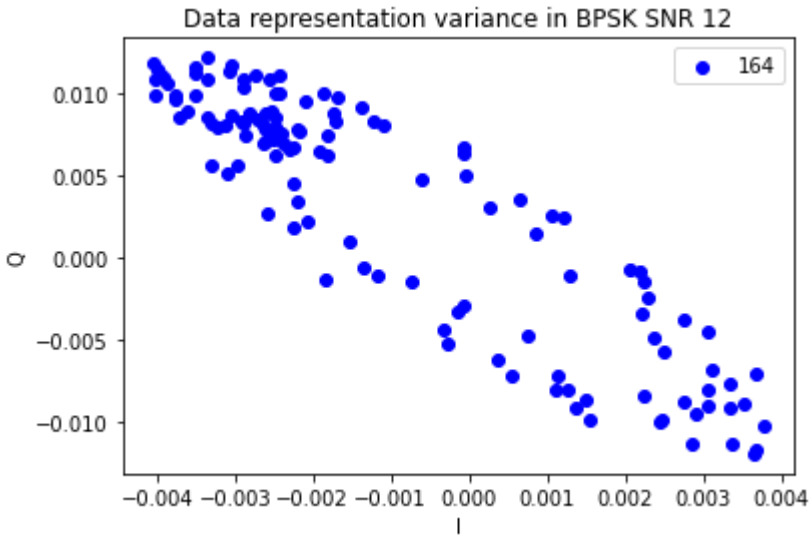

Data representation variance in BPSK SNR 12
159
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

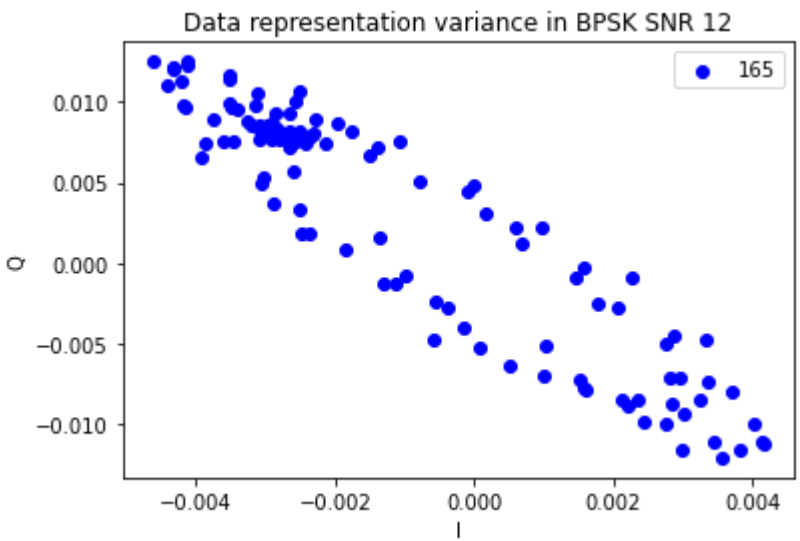

Data representation variance in BPSK SNR 12
160
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

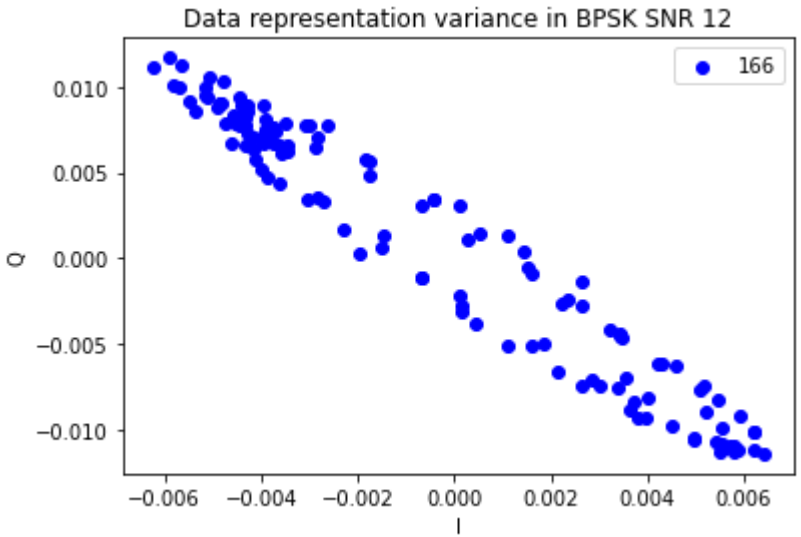

Data representation variance in BPSK SNR 12
161
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

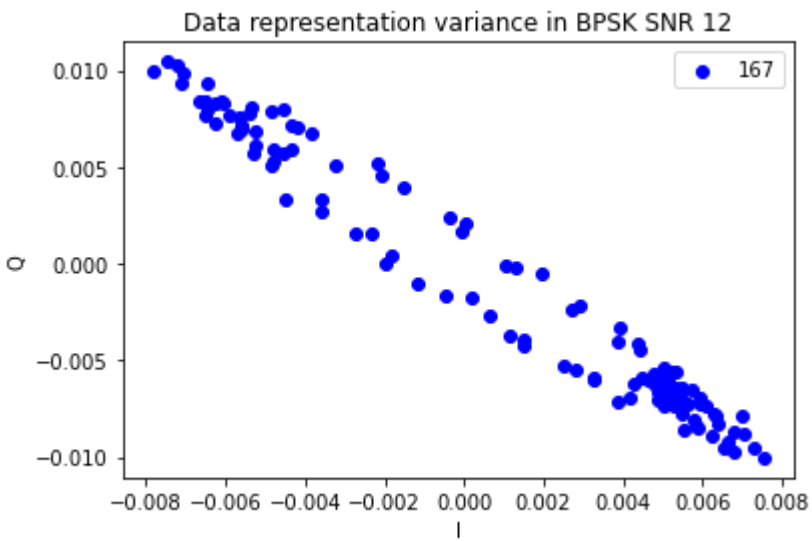

Data representation variance in BPSK SNR 12
162
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
163
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
164
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
165
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I


Data representation variance in BPSK SNR 12
166
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
167
0.010
0.005
0.000
−0.005
−0.010
Q
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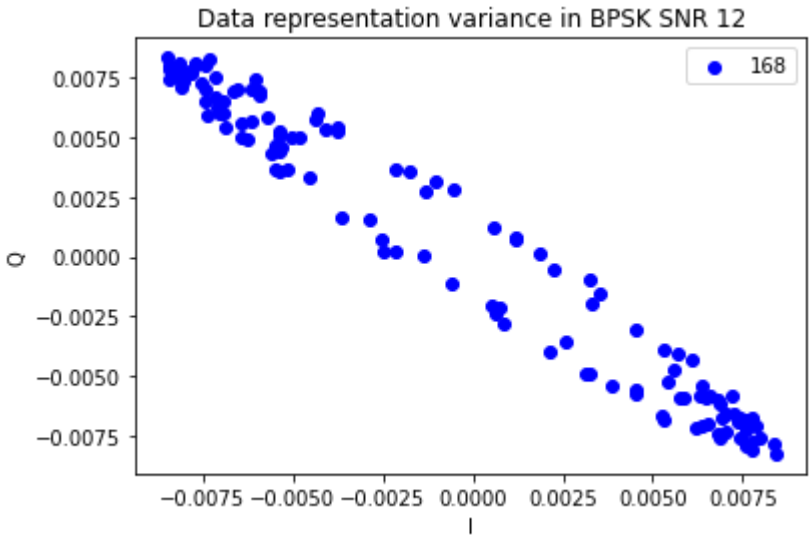
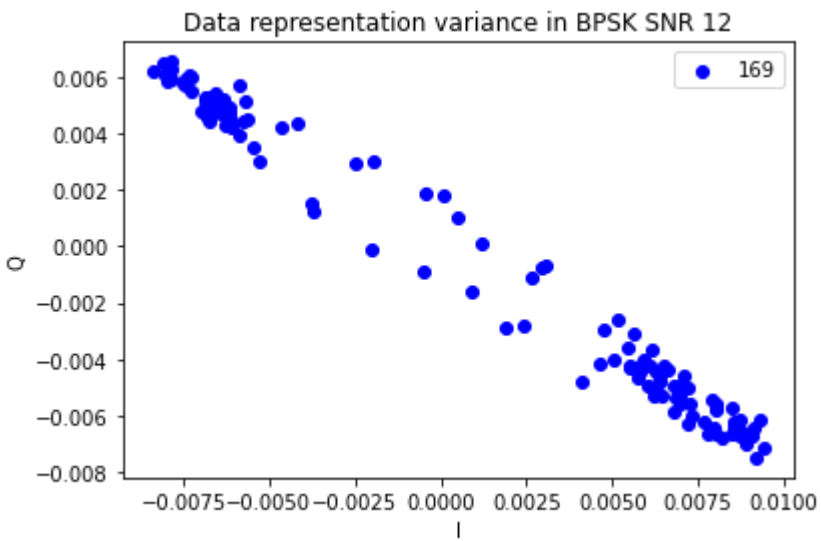
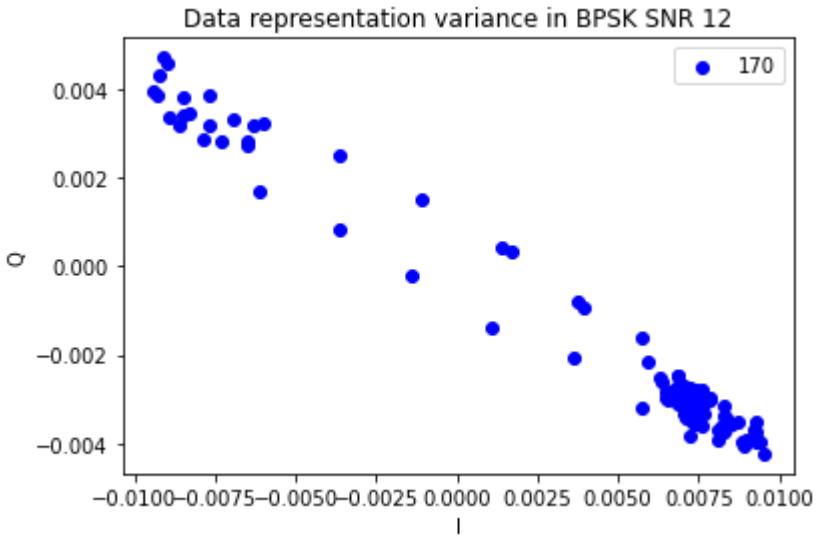
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I


Data representation variance in BPSK SNR 12
168
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
169
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
170
0.004
0.002
0.000
−0.002
−0.004
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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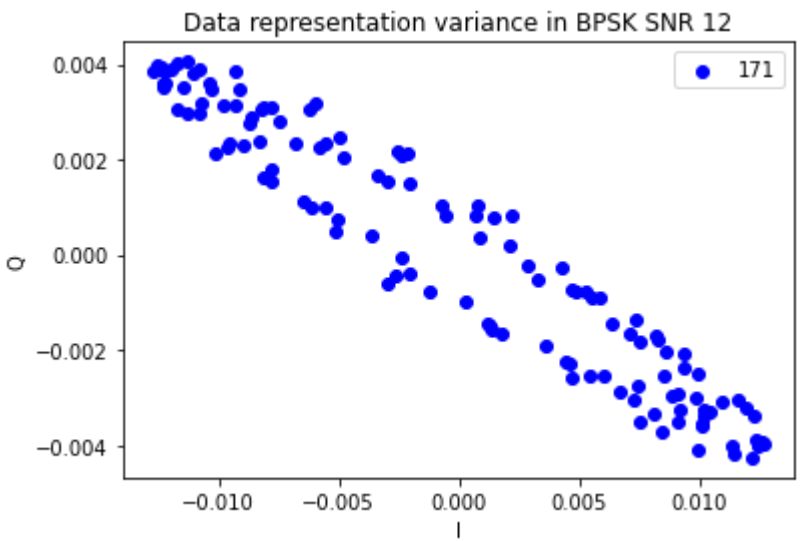
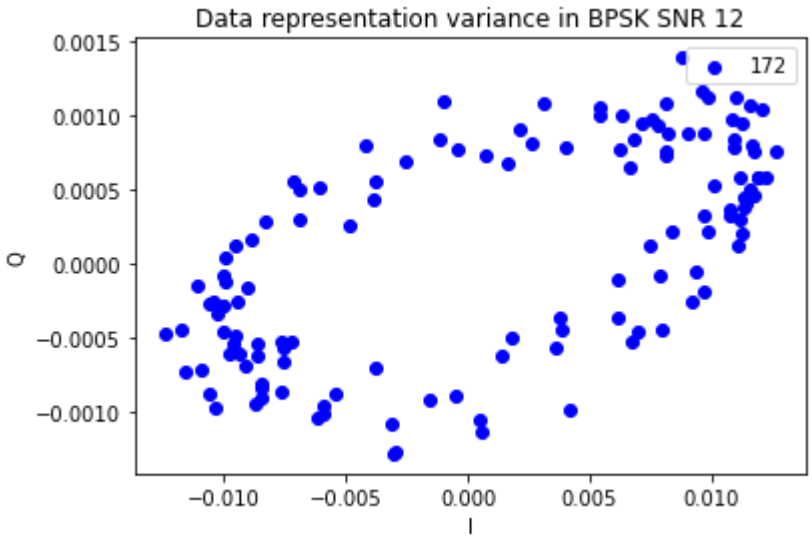

Data representation variance in BPSK SNR 12
171
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010 −0.005 0.000 0.005 0.010
I


Data representation variance in BPSK SNR 12
172
0.0015
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0.0005
0.0000
−0.0005
−0.0010
Q
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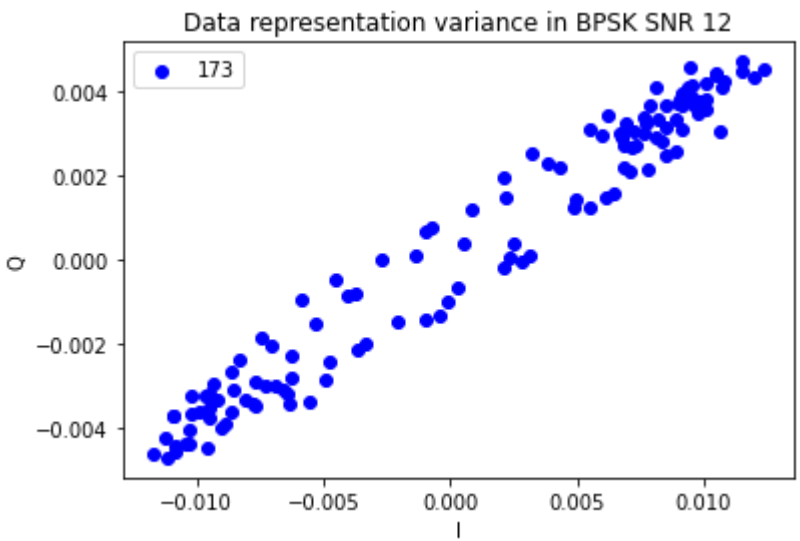
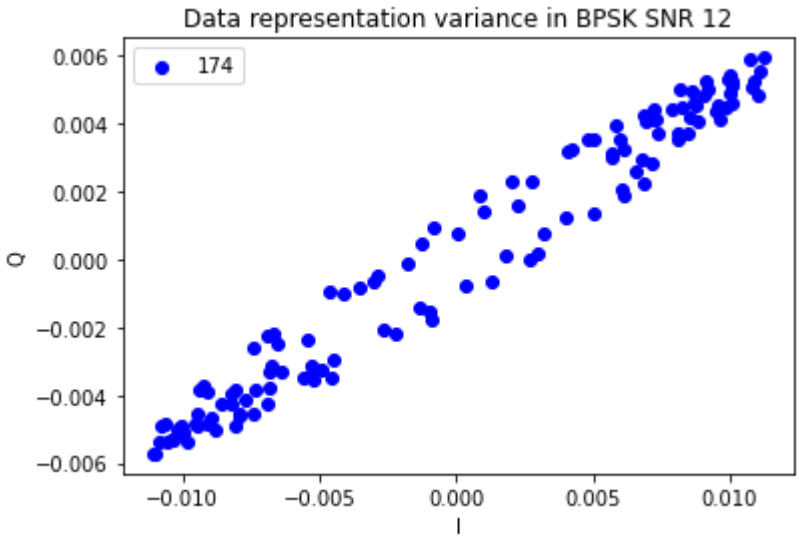
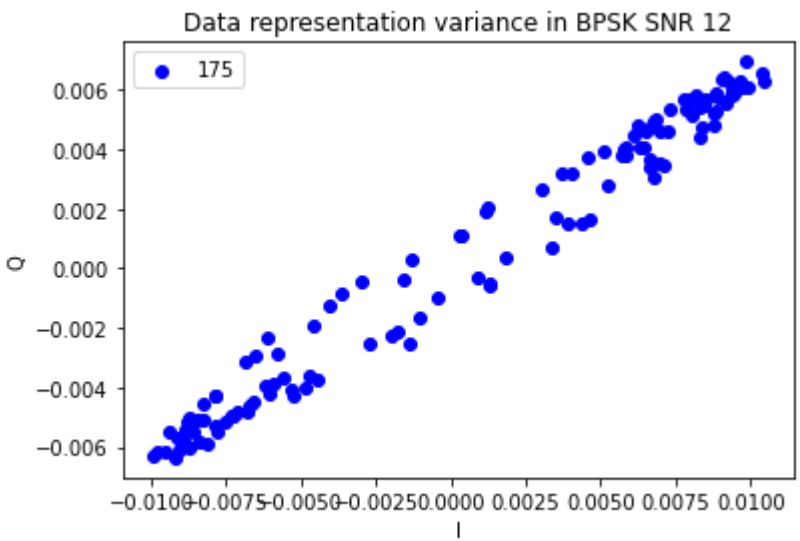
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
173
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
174
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
175
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
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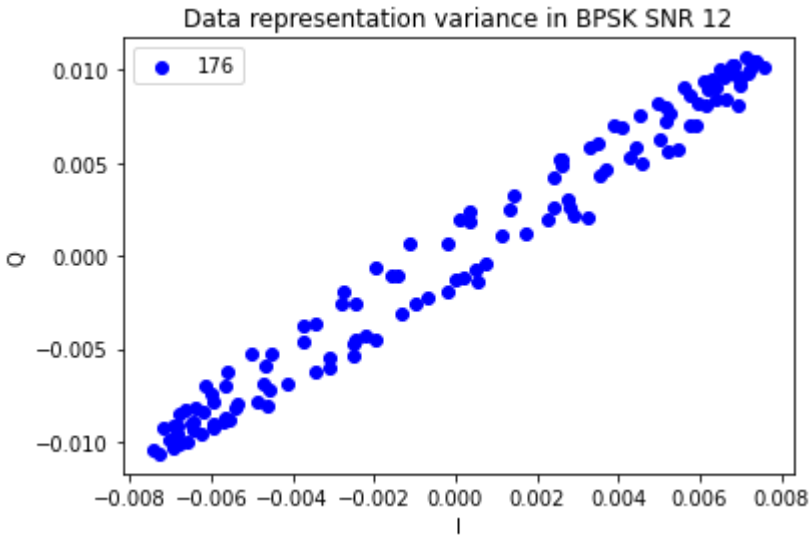
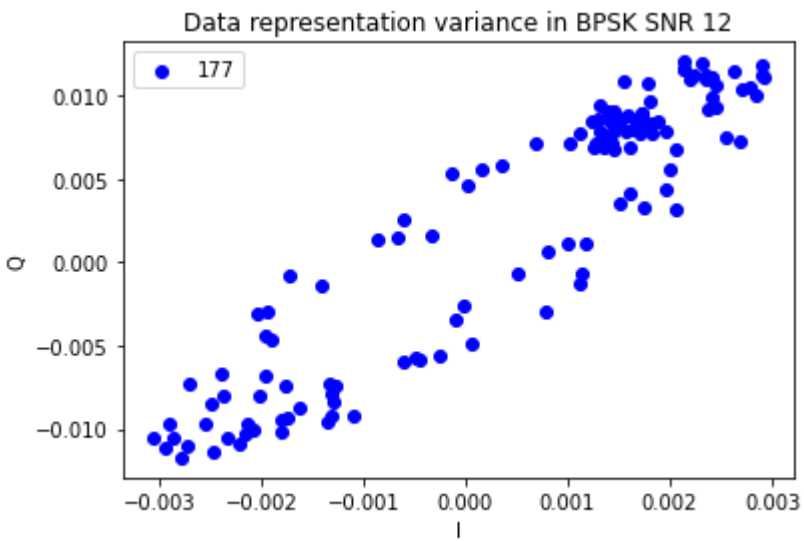
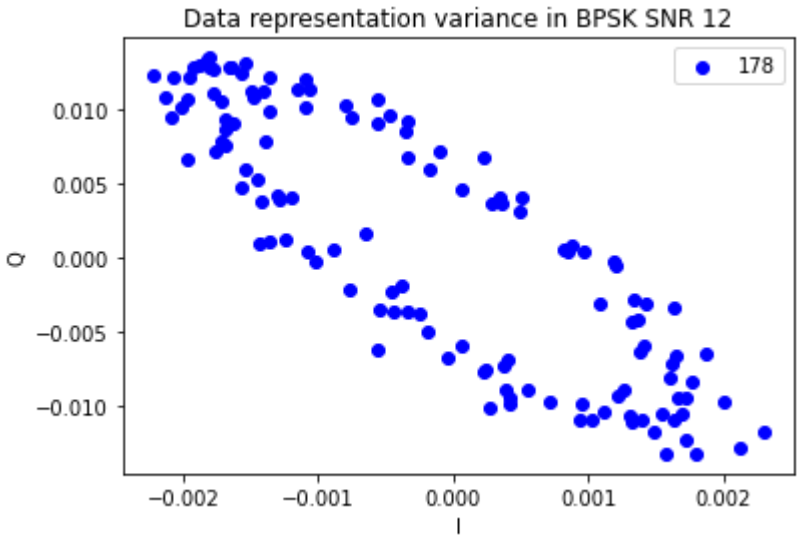
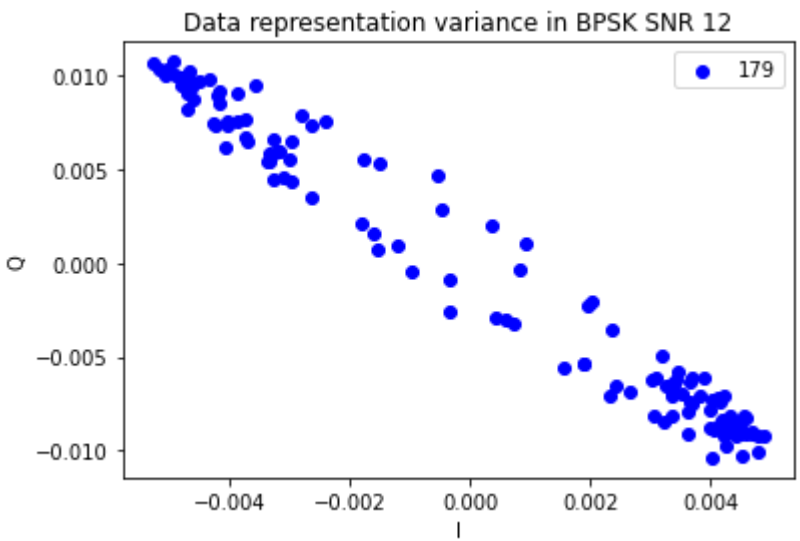
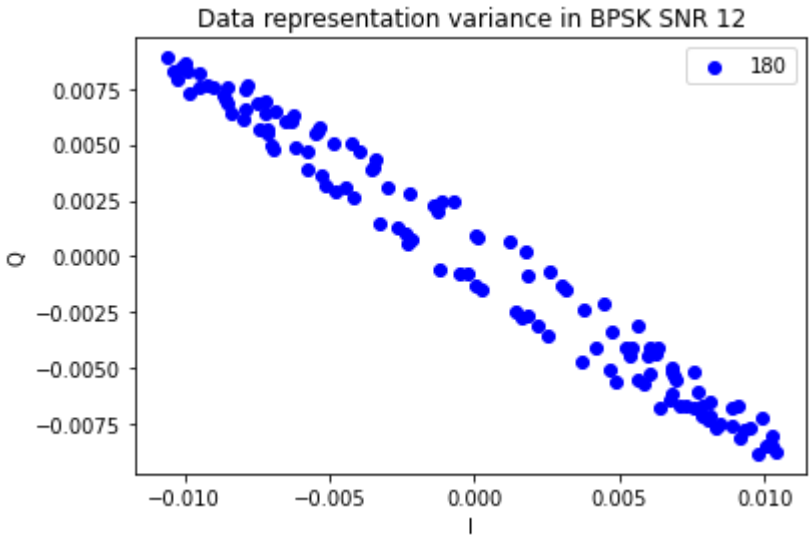
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

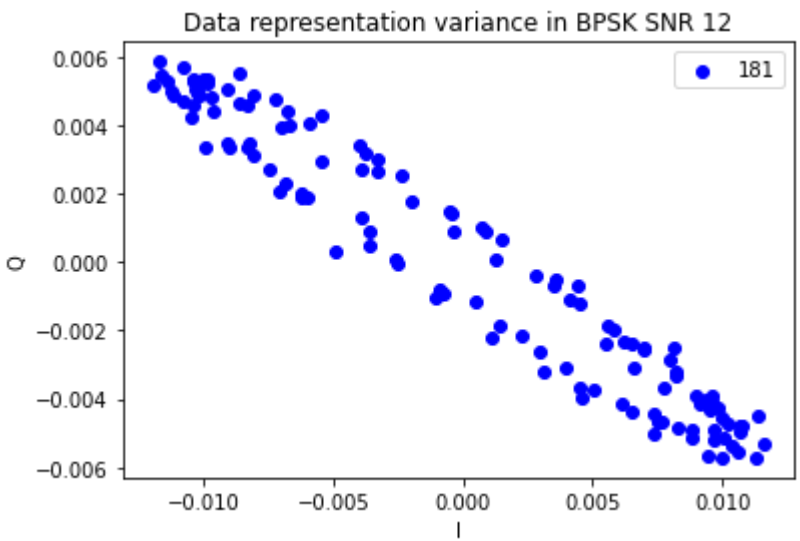

Data representation variance in BPSK SNR 12
176
0.010
0.005
0.000
−0.005
−0.010
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

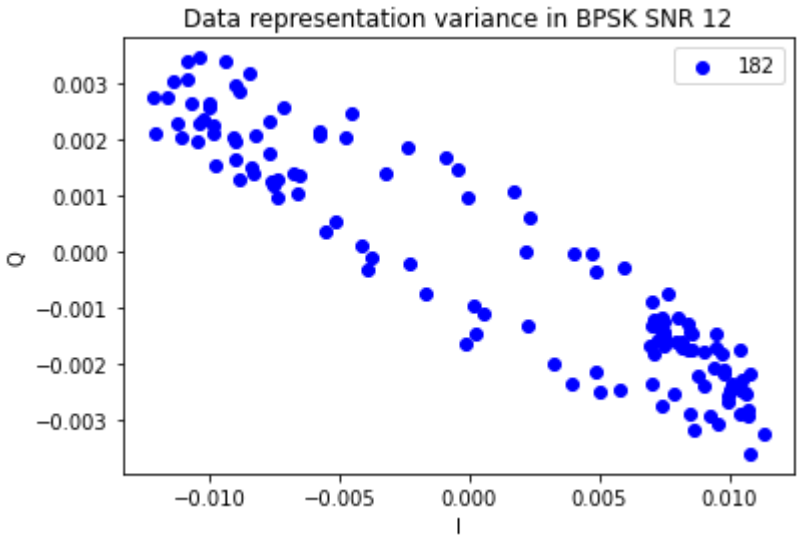

Data representation variance in BPSK SNR 12
177
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

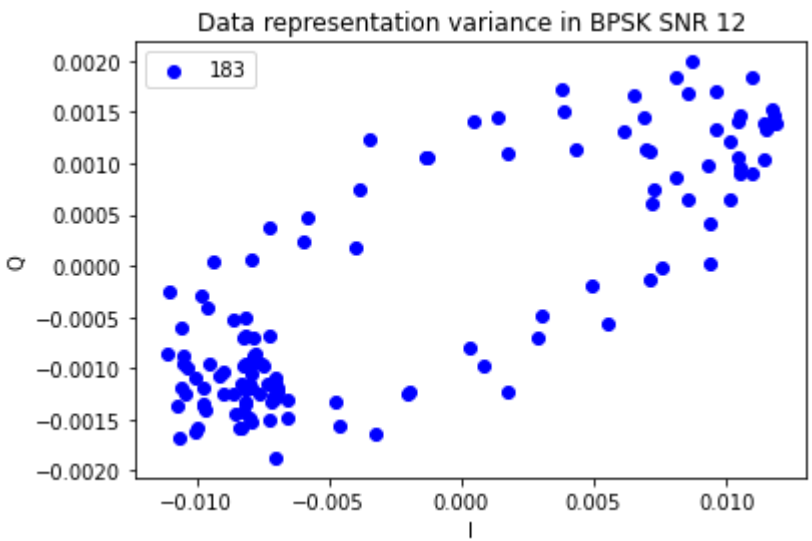

Data representation variance in BPSK SNR 12
178
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

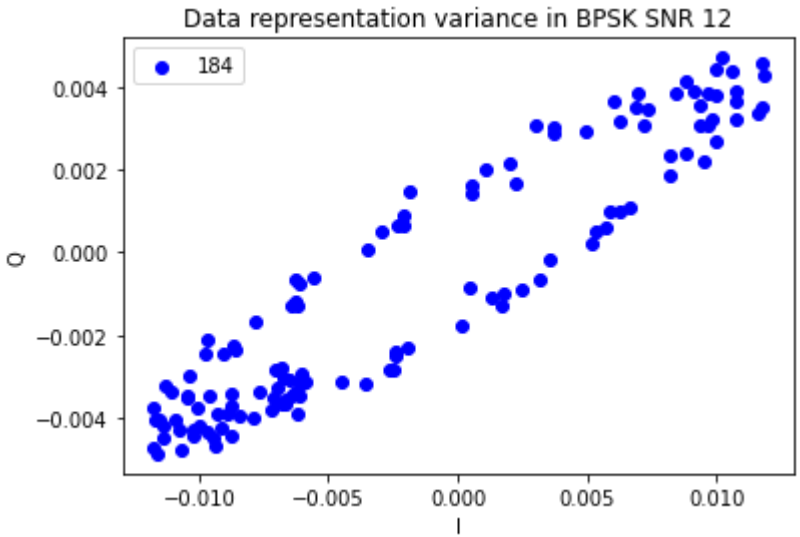

Data representation variance in BPSK SNR 12
179
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

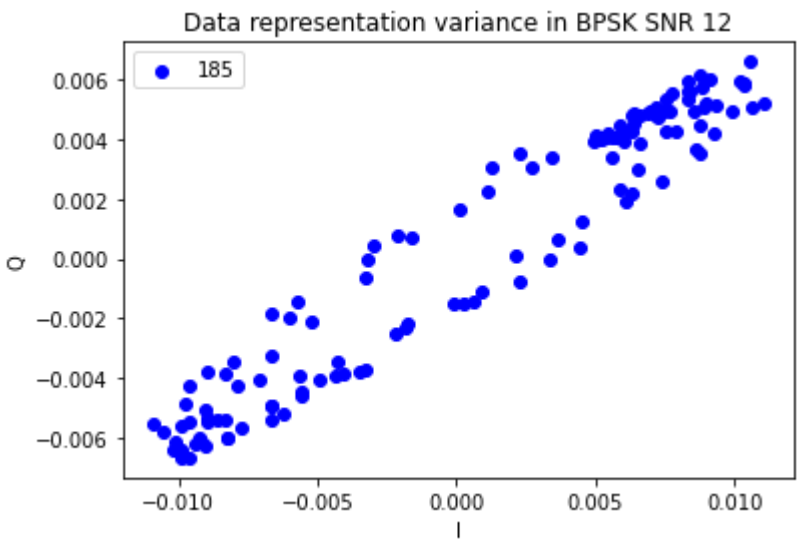

Data representation variance in BPSK SNR 12
180
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.010
−0.005
0.000
0.005
0.010
I

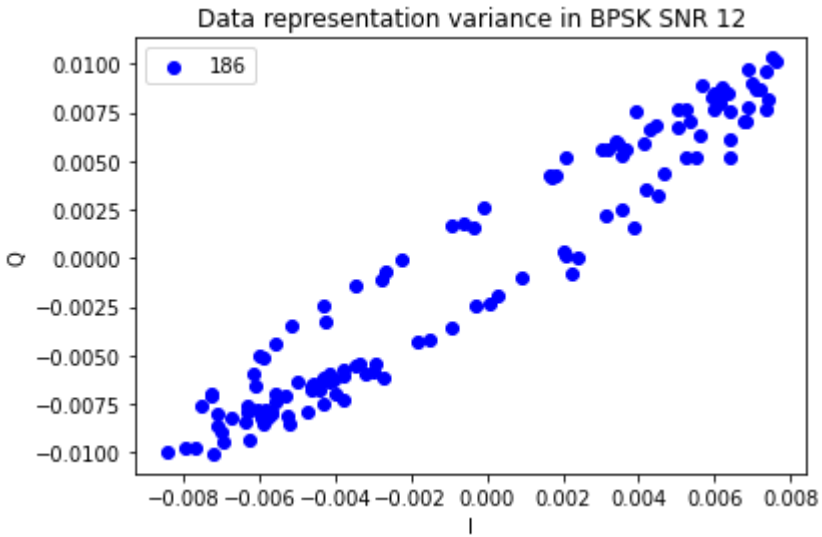

Data representation variance in BPSK SNR 12
181
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

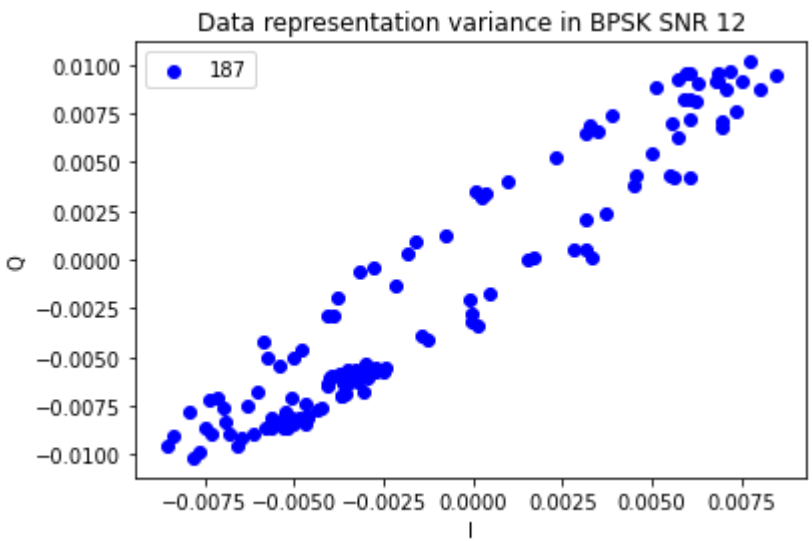

Data representation variance in BPSK SNR 12
182
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

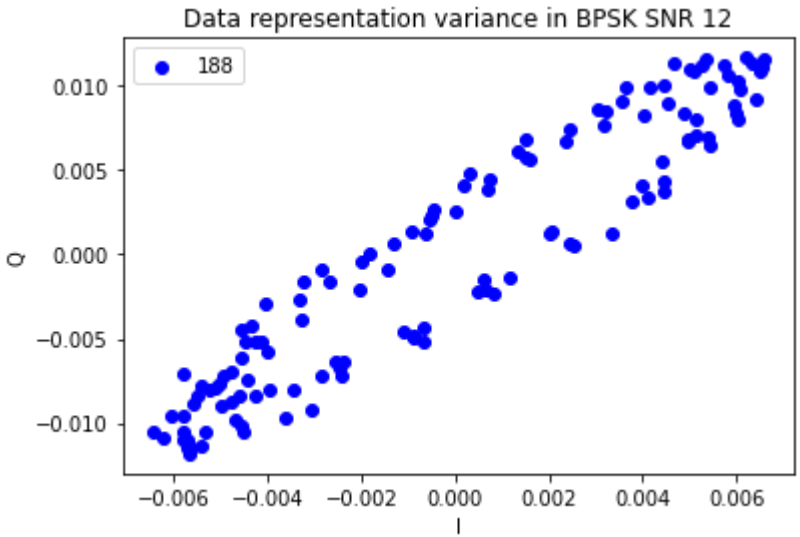

Data representation variance in BPSK SNR 12
183
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I

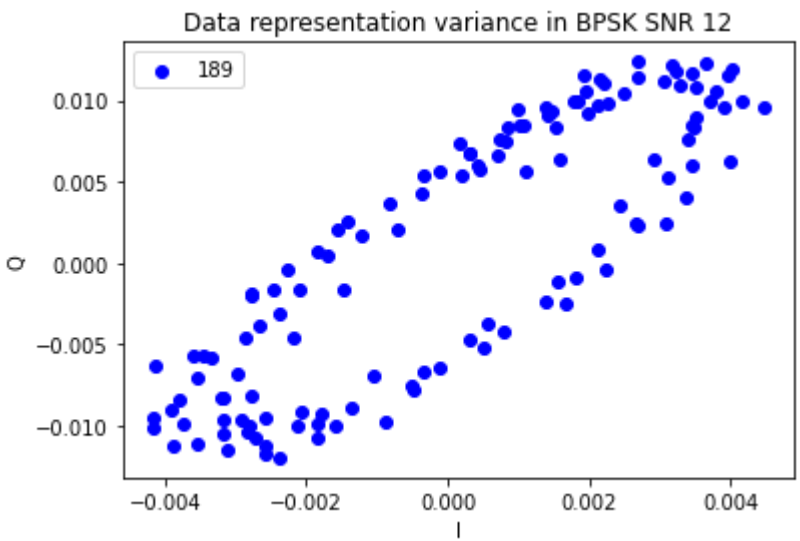

Data representation variance in BPSK SNR 12
184
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
185
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
186
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
187
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
188
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
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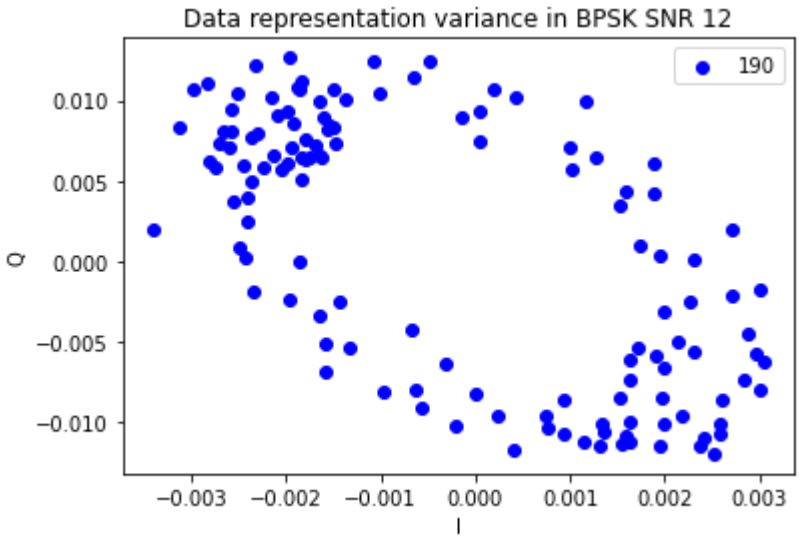
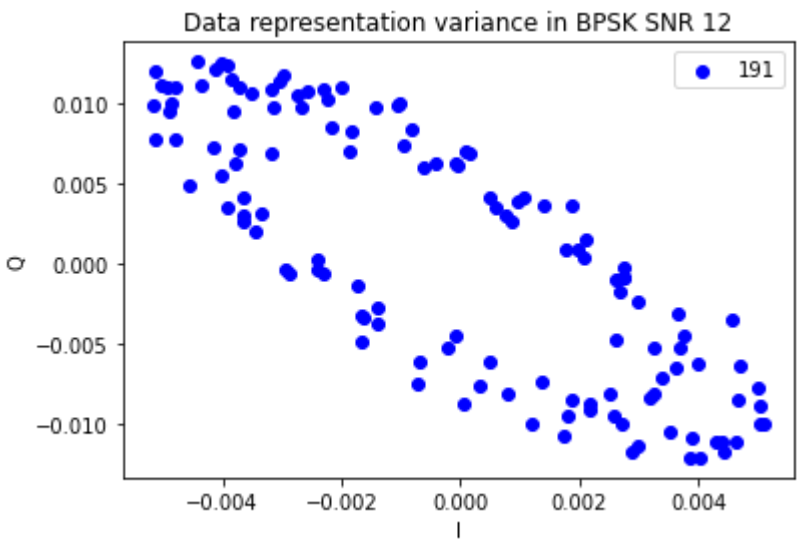
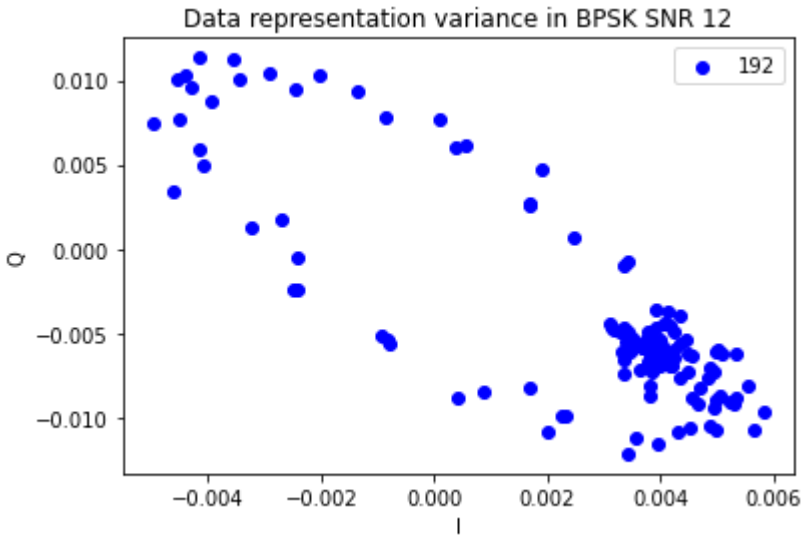
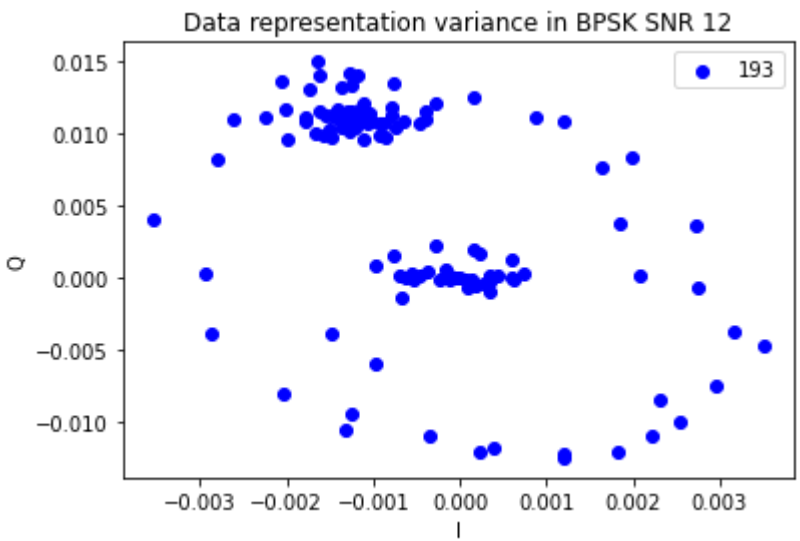
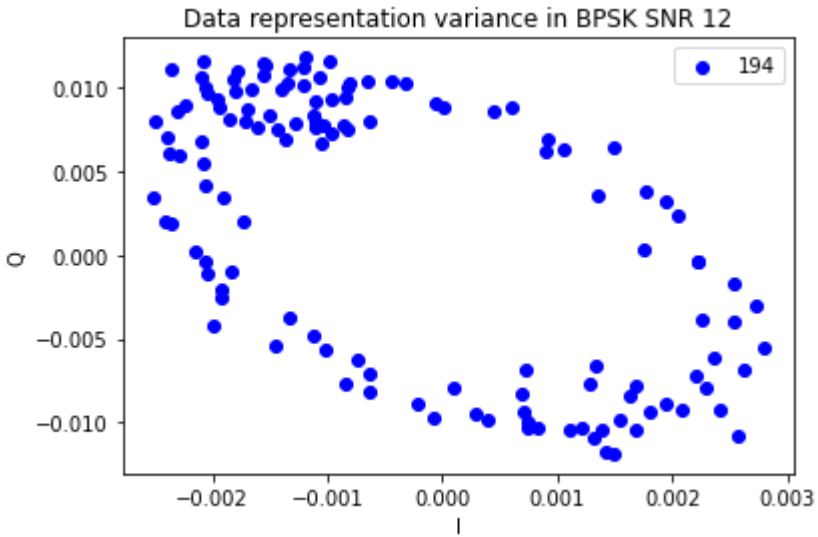
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

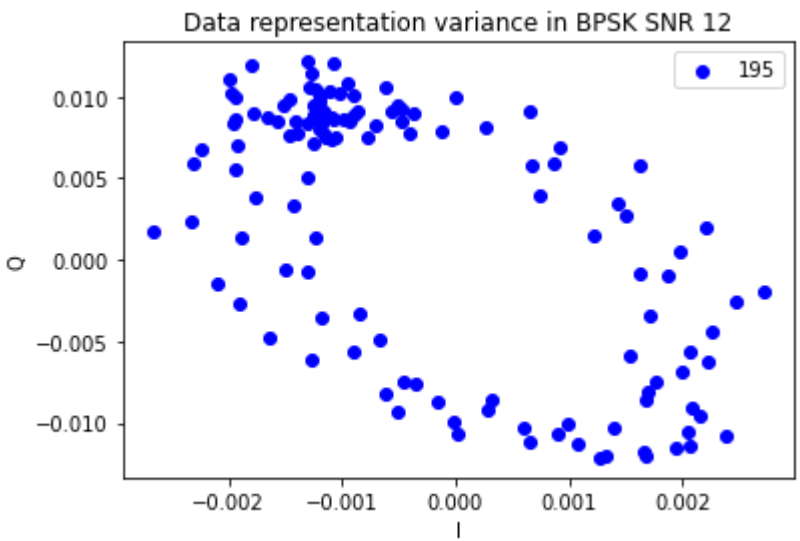

Data representation variance in BPSK SNR 12
190
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

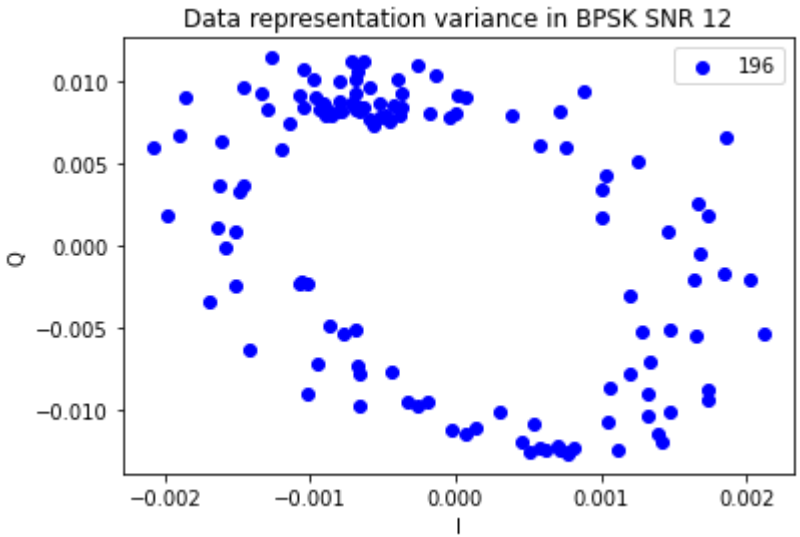

Data representation variance in BPSK SNR 12
191
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

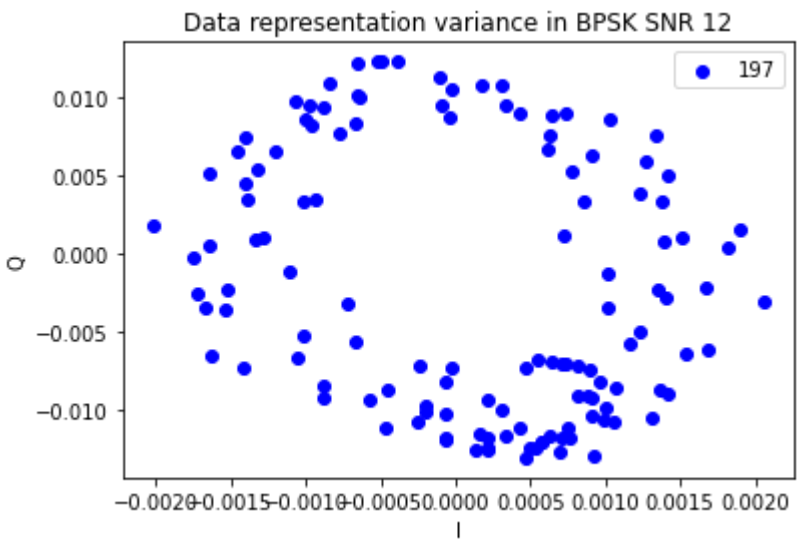

Data representation variance in BPSK SNR 12
192
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
193
0.015
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
194
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
195
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
196
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
197
0.010
0.005
0.000
−0.005
−0.010
Q
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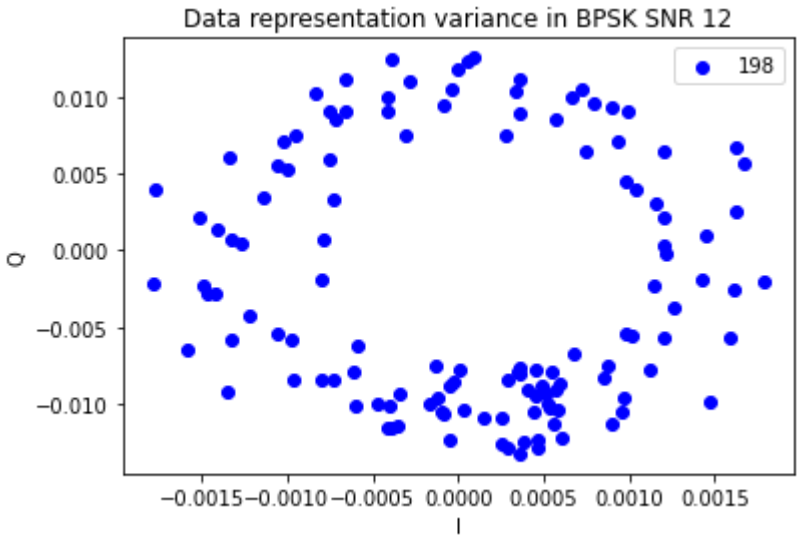
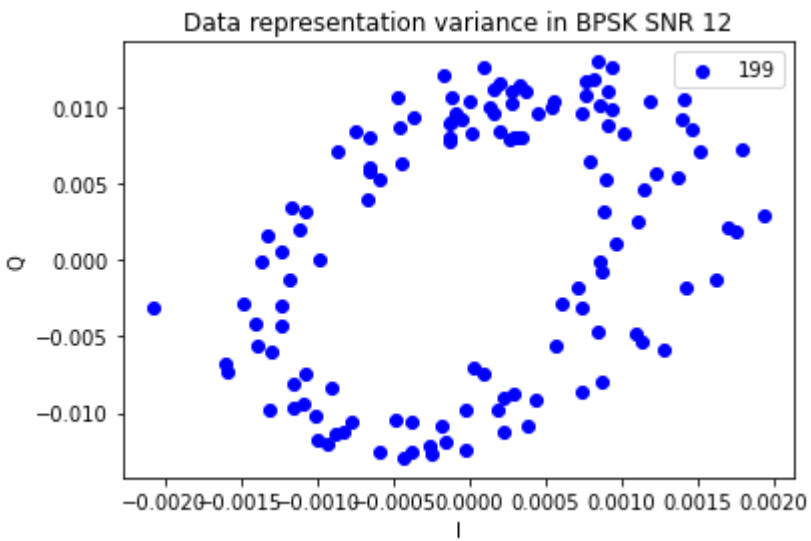
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
I


Data representation variance in BPSK SNR 12
198
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I


Data representation variance in BPSK SNR 12
199
0.010
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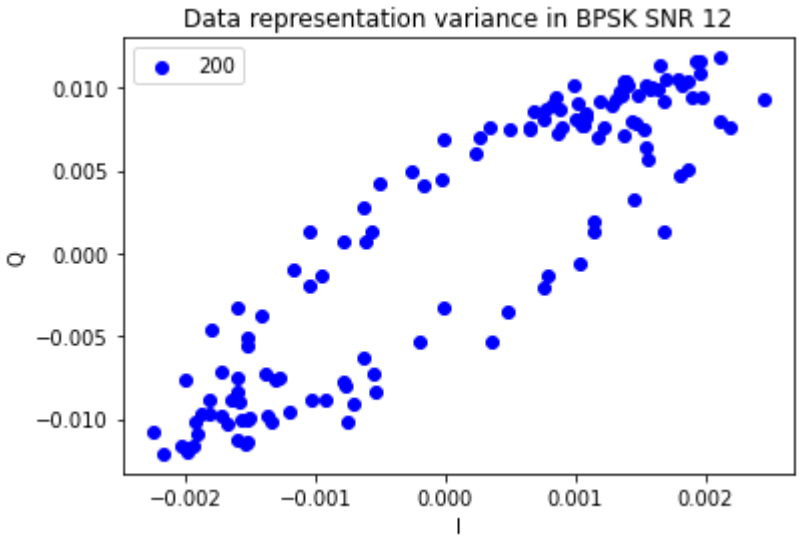
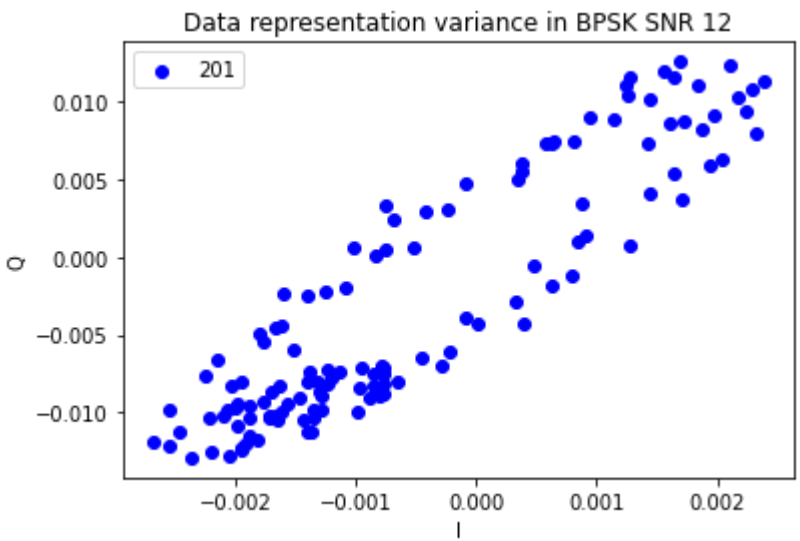
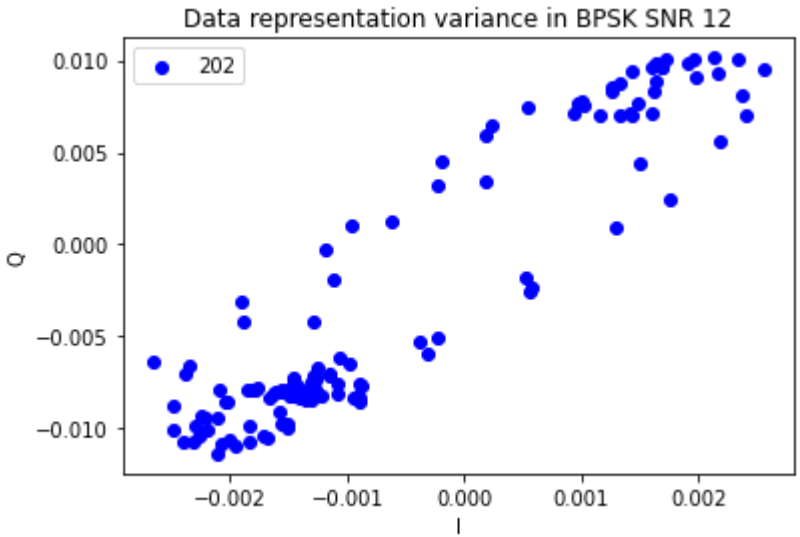
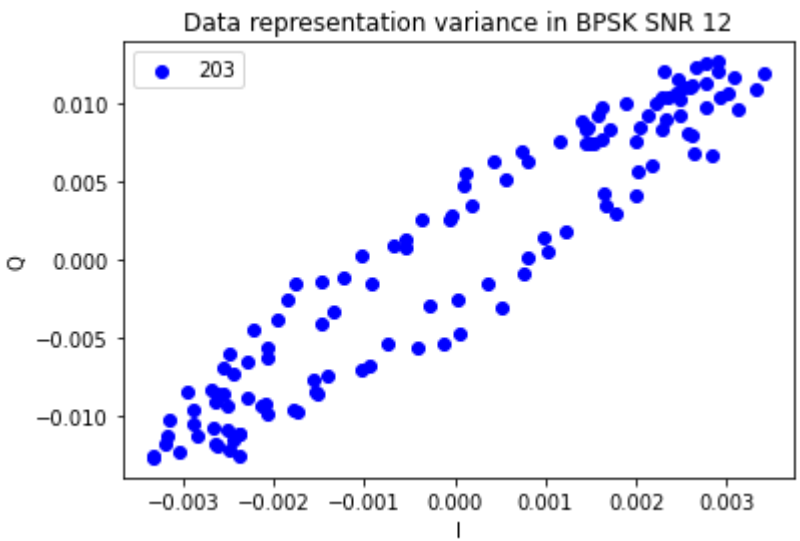
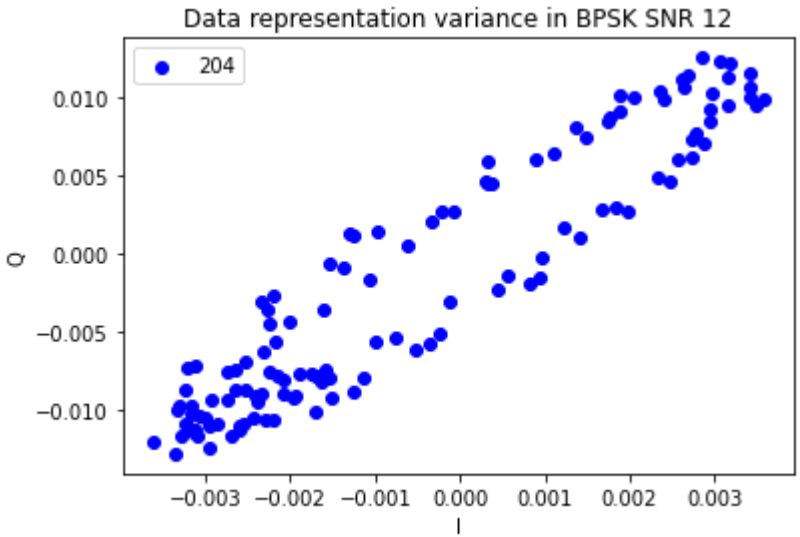
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

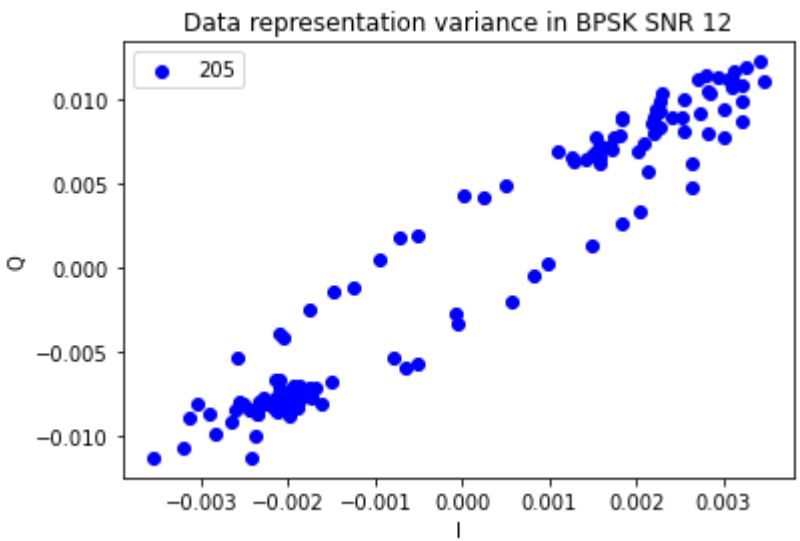

Data representation variance in BPSK SNR 12
200
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

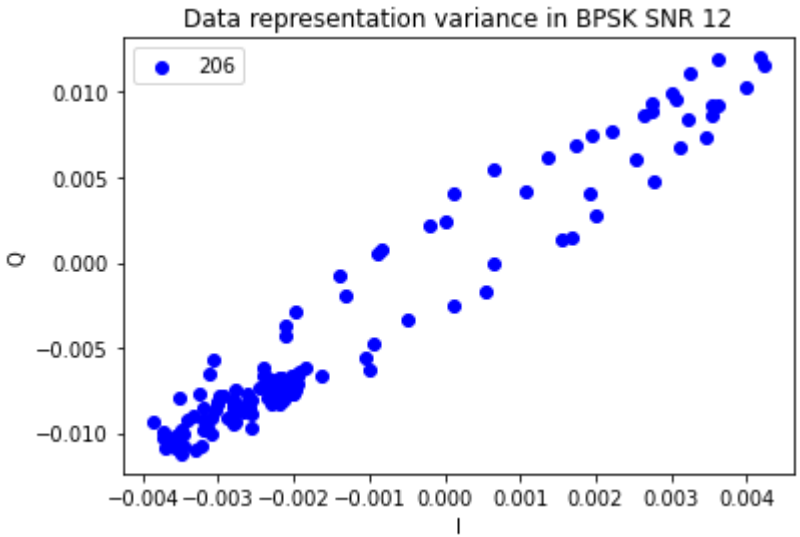

Data representation variance in BPSK SNR 12
201
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

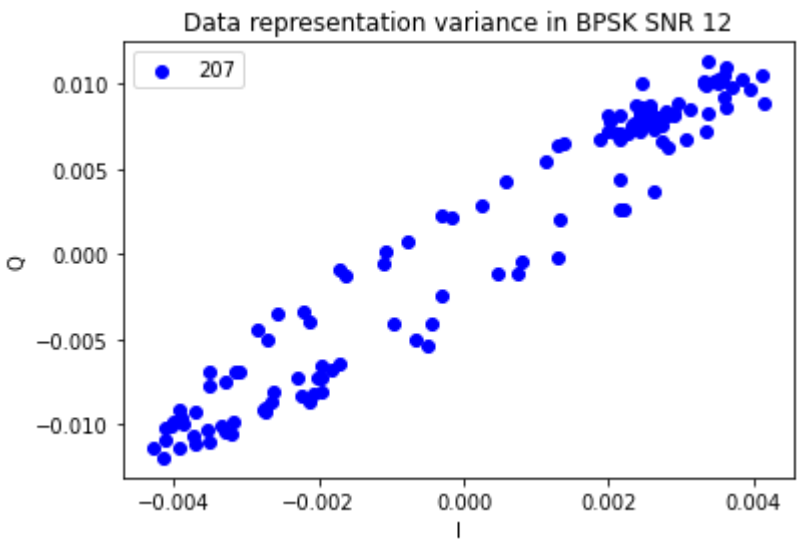

Data representation variance in BPSK SNR 12
202
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

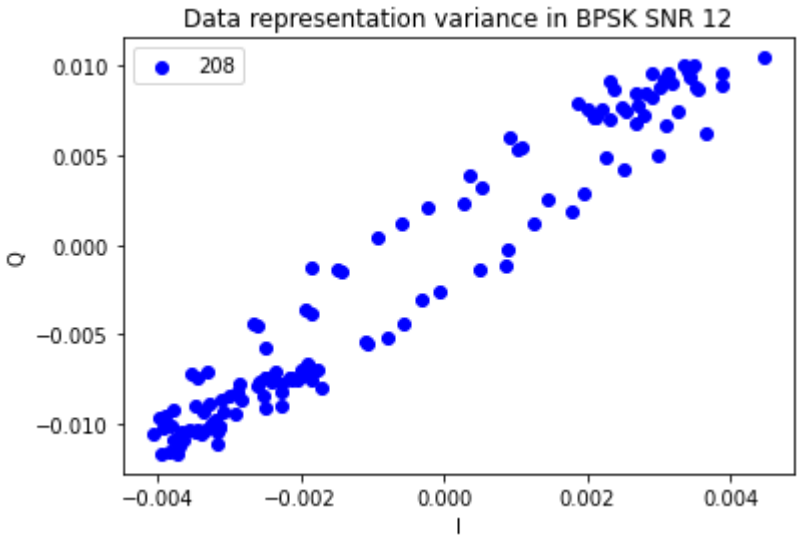

Data representation variance in BPSK SNR 12
203
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

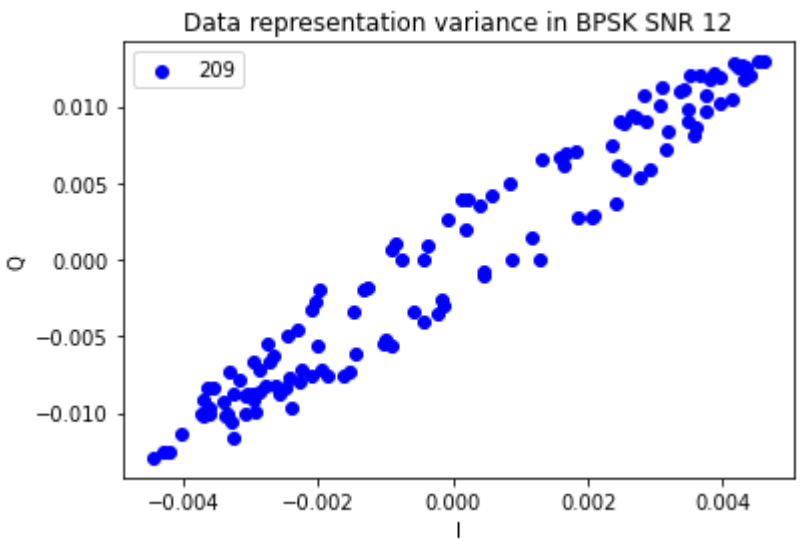

Data representation variance in BPSK SNR 12
204
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

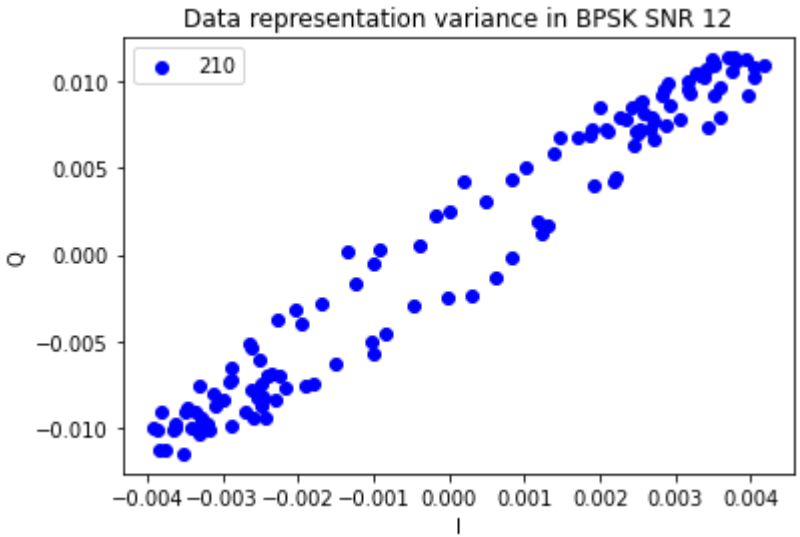

Data representation variance in BPSK SNR 12
205
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

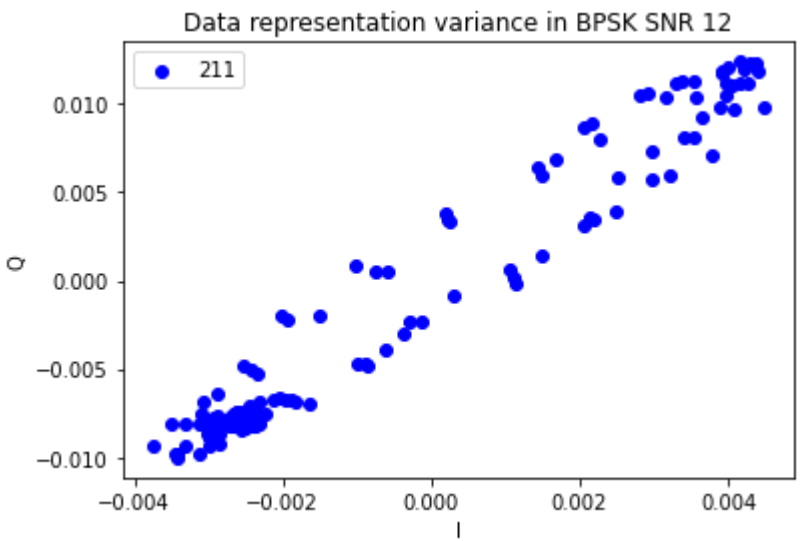

Data representation variance in BPSK SNR 12
206
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

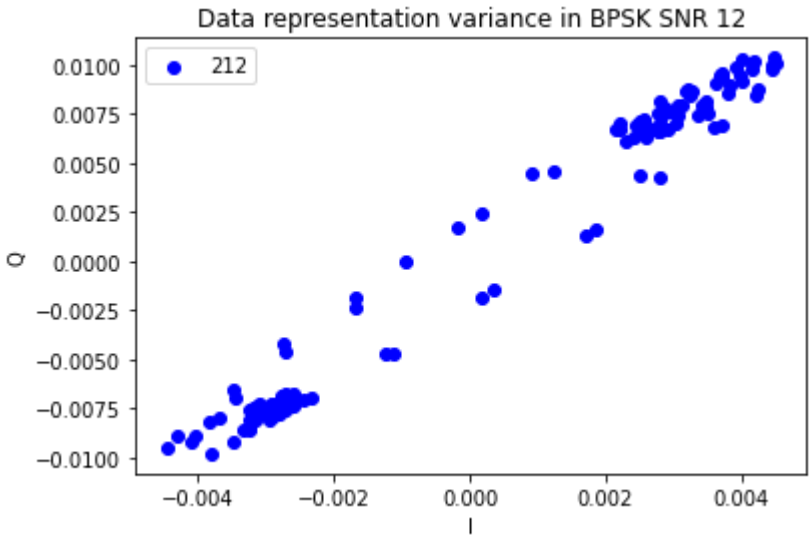

Data representation variance in BPSK SNR 12
207
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

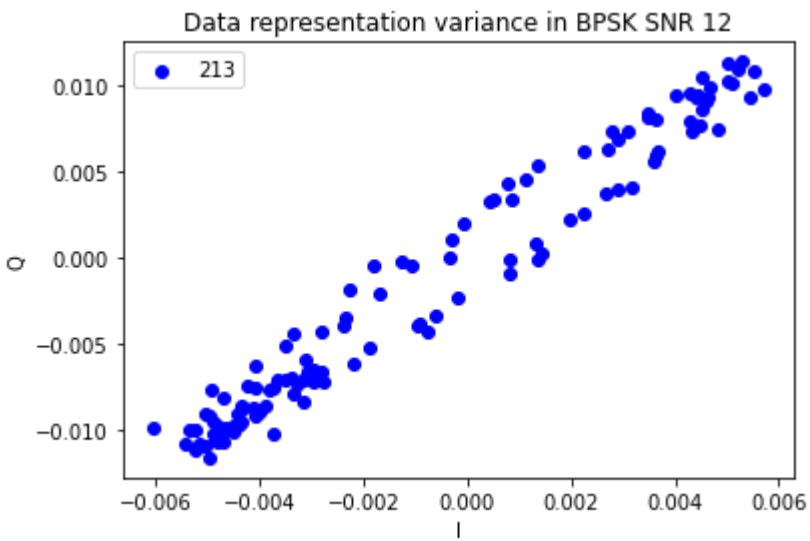

Data representation variance in BPSK SNR 12
208
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

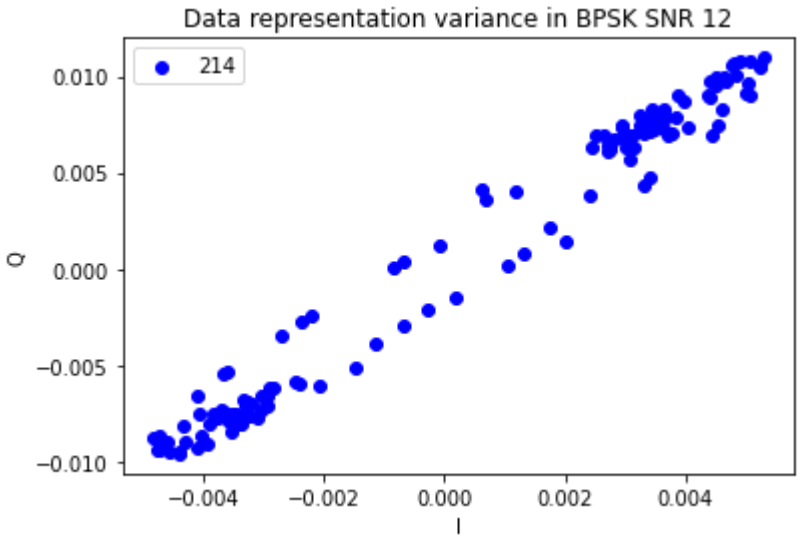

Data representation variance in BPSK SNR 12
209
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
210
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
211
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I


Data representation variance in BPSK SNR 12
212
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
213
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
214
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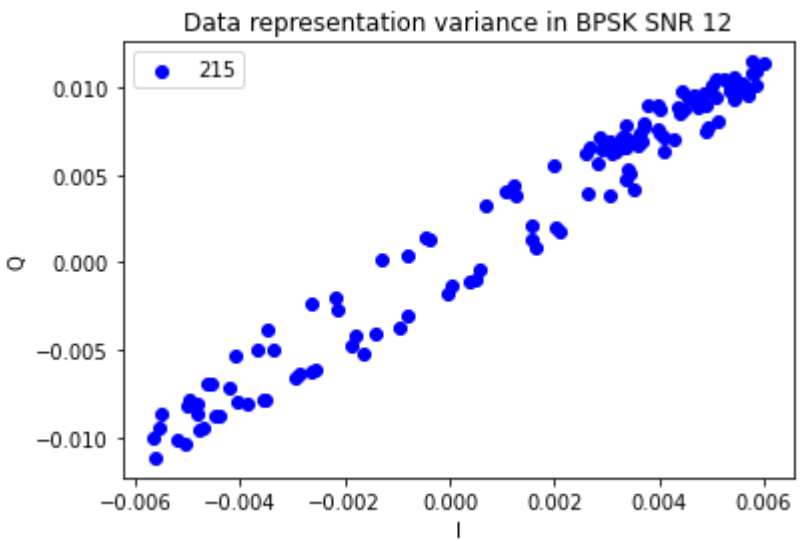
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
215
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
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0.004
0.006
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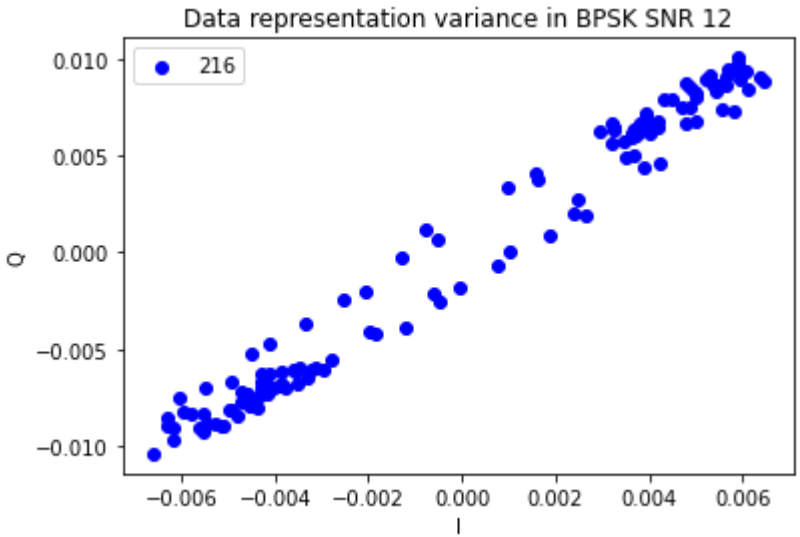
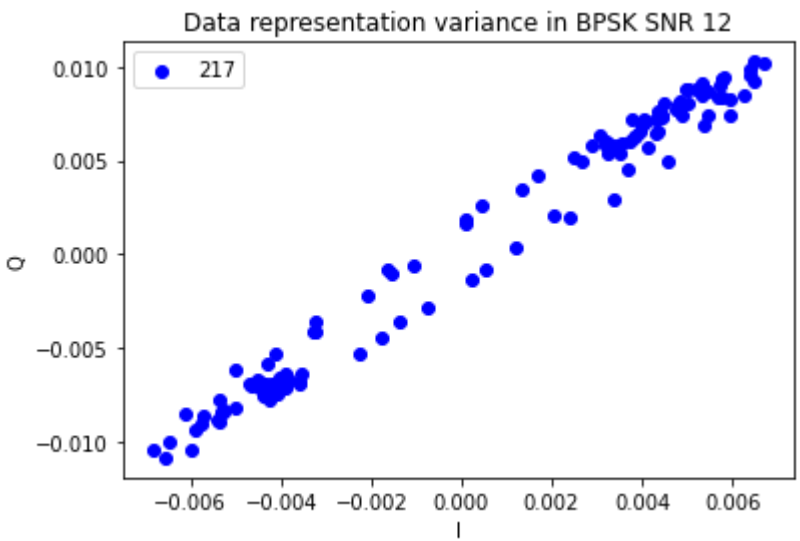
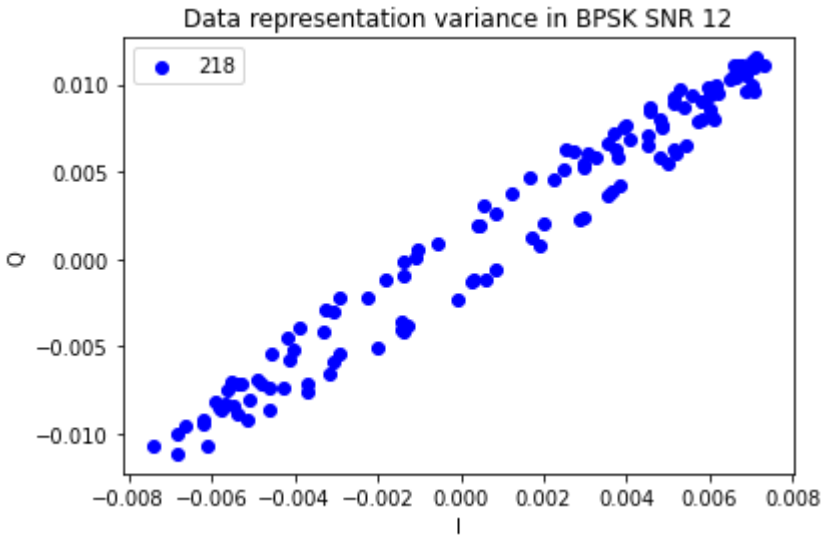

Data representation variance in BPSK SNR 12
216
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
217
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
218
0.010
0.005
0.000
−0.005
−0.010
Q
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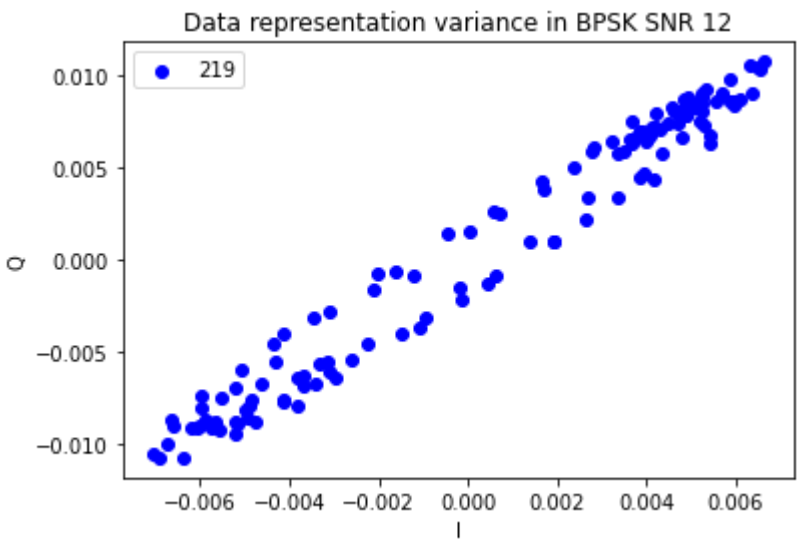
I


Data representation variance in BPSK SNR 12
219
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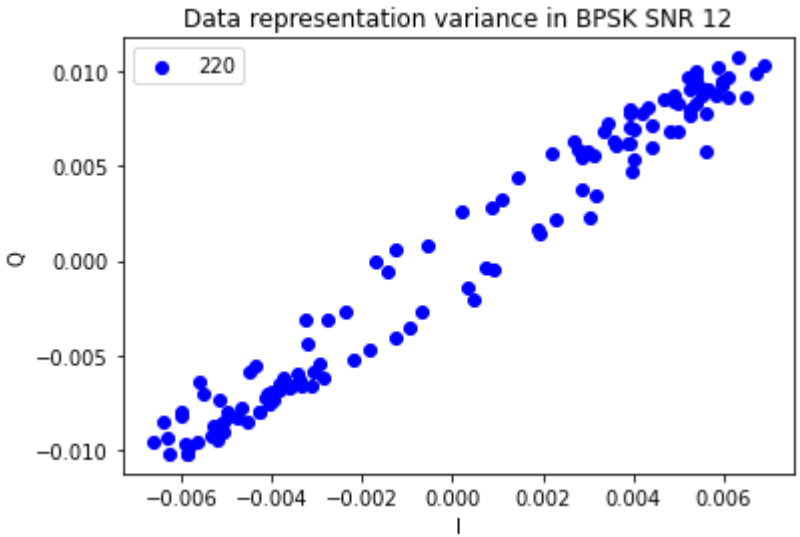
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
220
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
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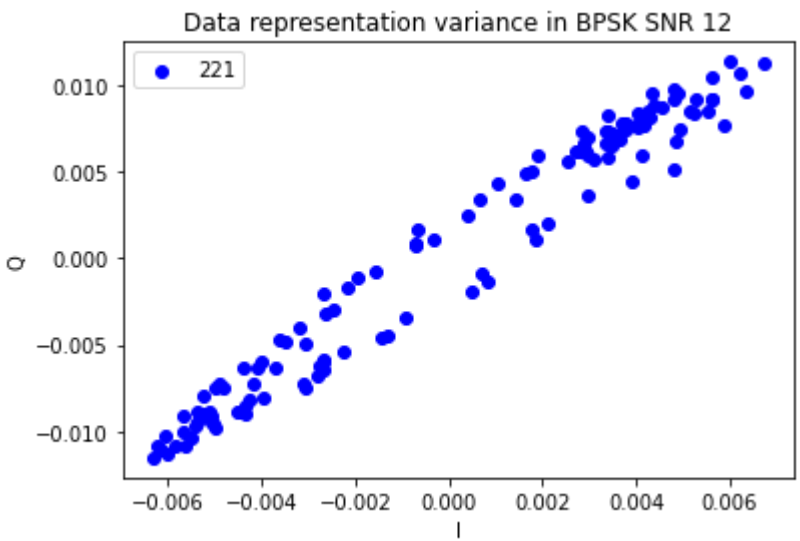
Data representation variance in BPSK SNR 12
221
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
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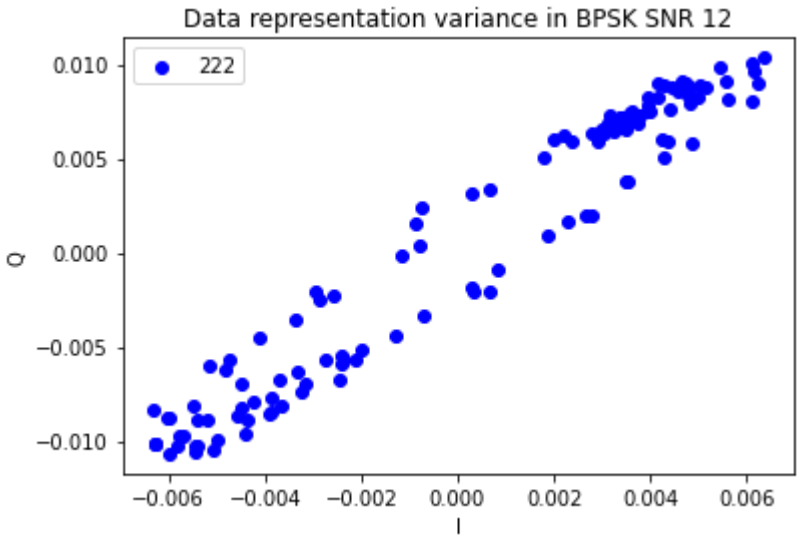
0.004
0.006
I


Data representation variance in BPSK SNR 12
222
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.004
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0.000
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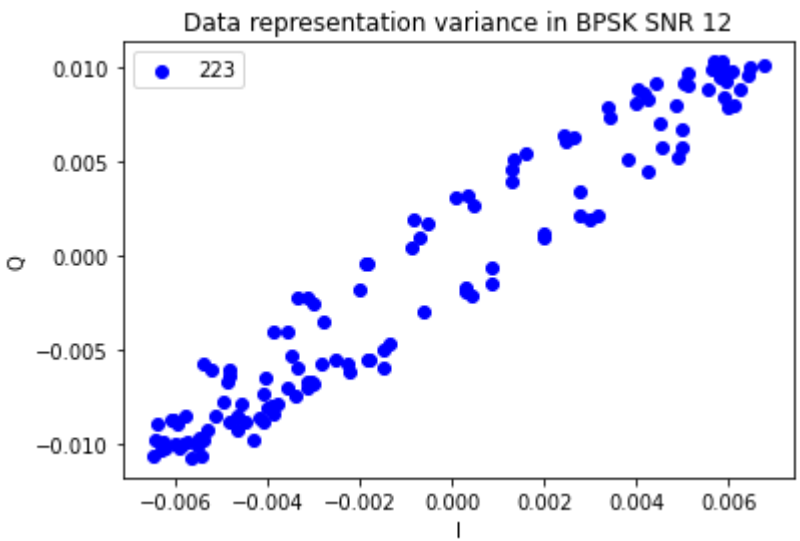
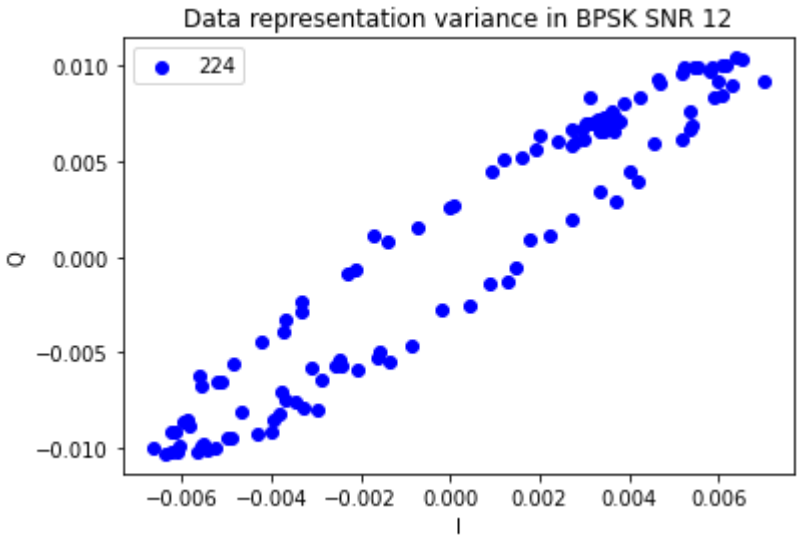
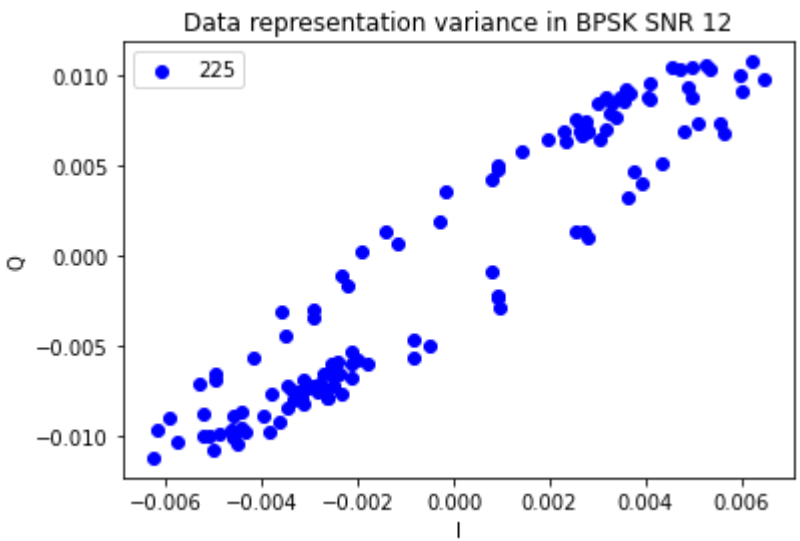
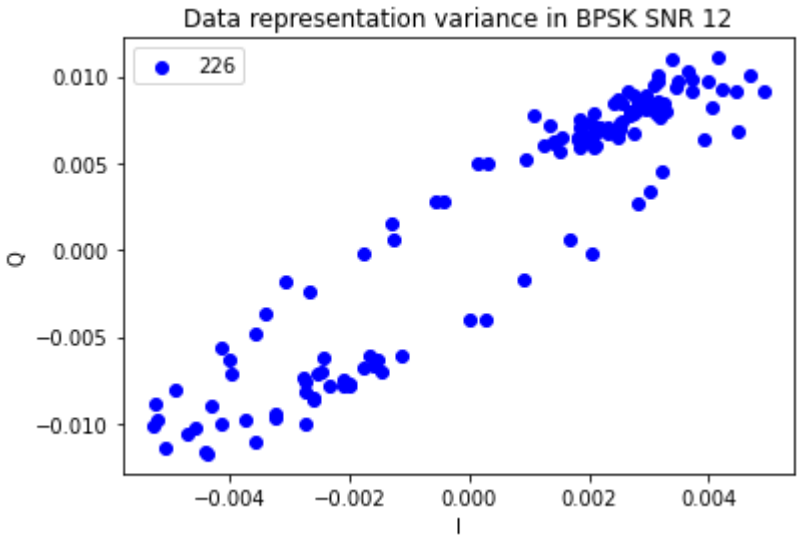
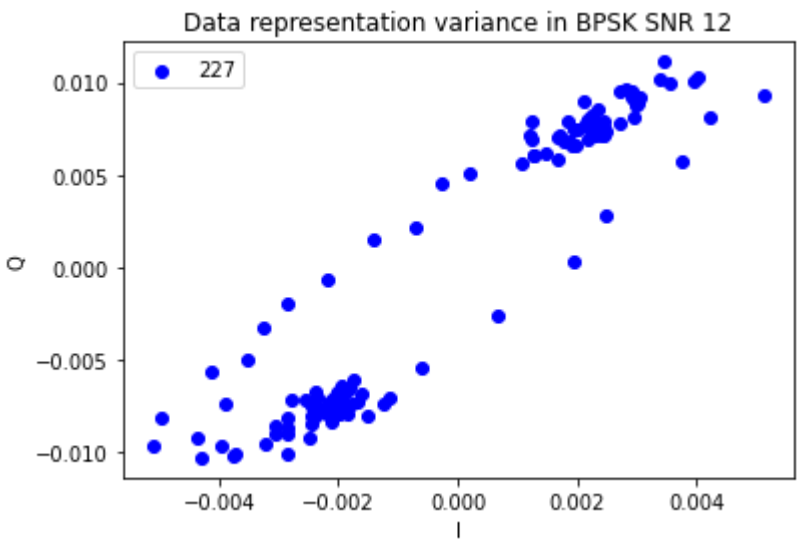
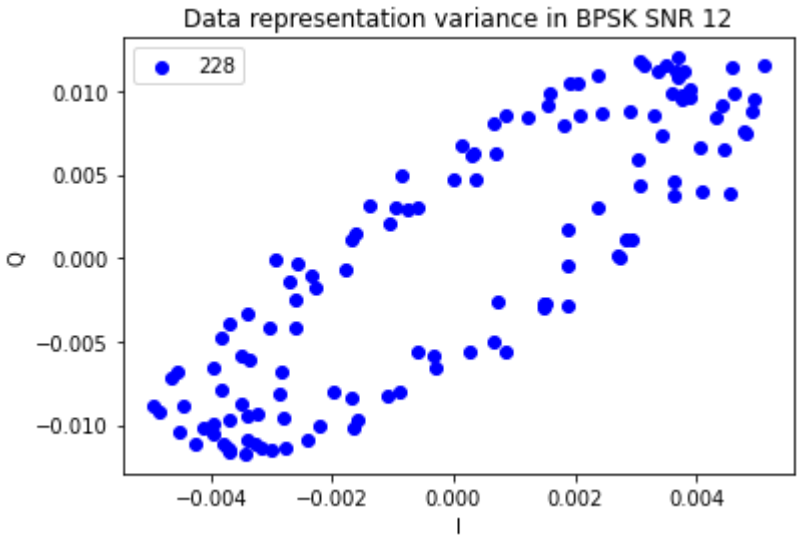

Data representation variance in BPSK SNR 12
223
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
224
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
225
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
226
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
227
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
228
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
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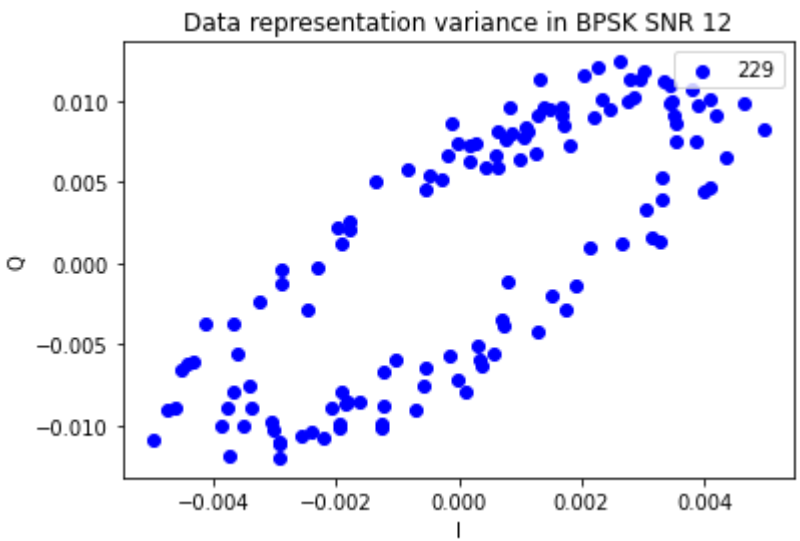
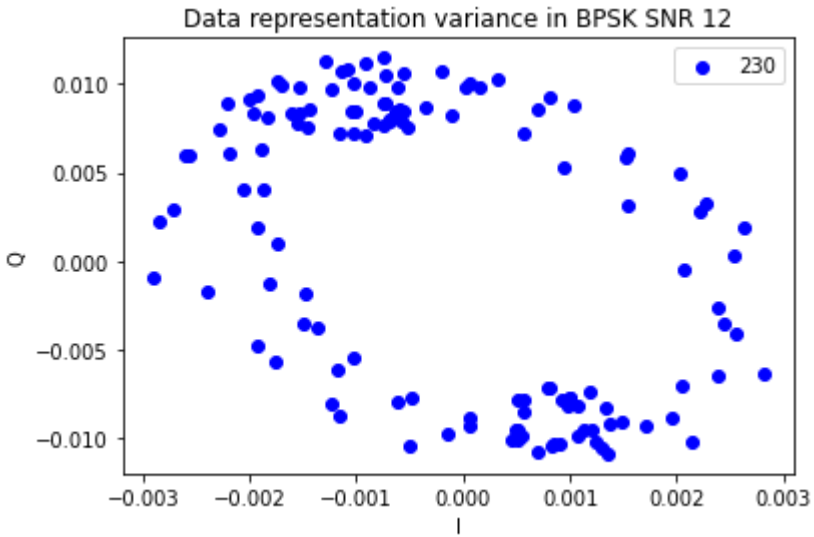
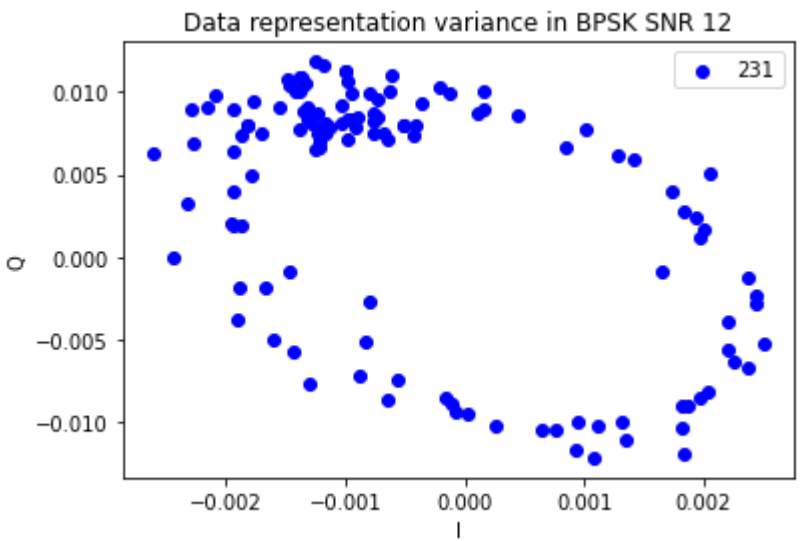

Data representation variance in BPSK SNR 12
229
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
230
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
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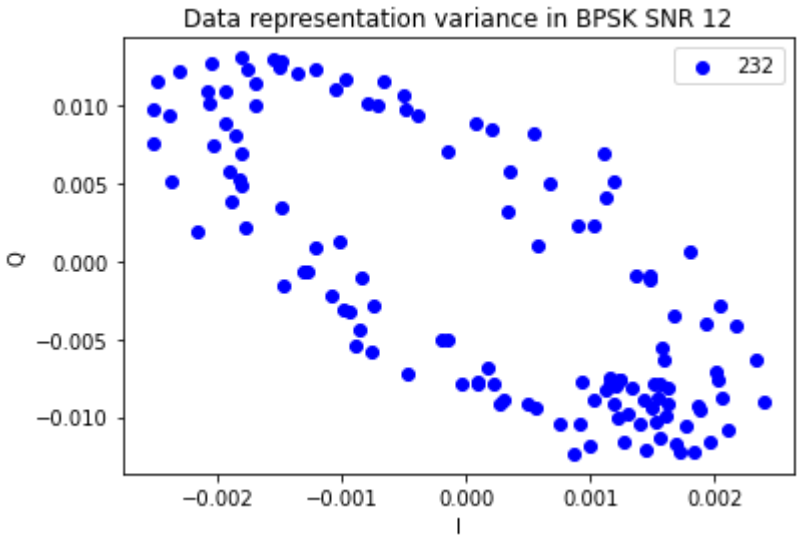
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
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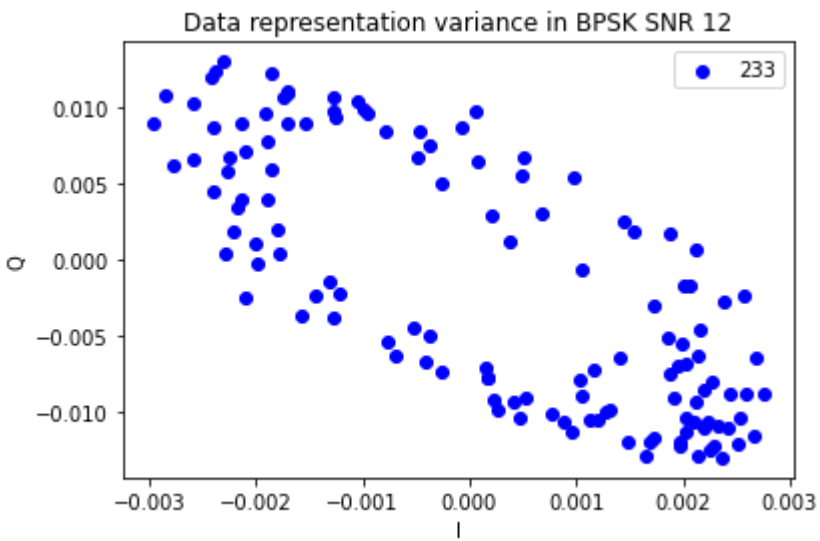
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
233
0.010
0.005
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−0.005
−0.010
Q
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−0.002
−0.001
0.000
0.001
0.002
0.003
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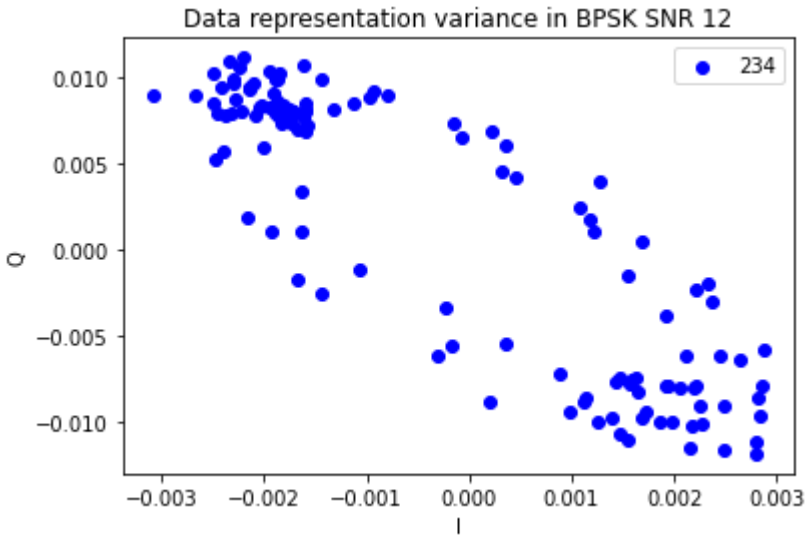
Data representation variance in BPSK SNR 12
234
0.010
0.005
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−0.005
−0.010
Q
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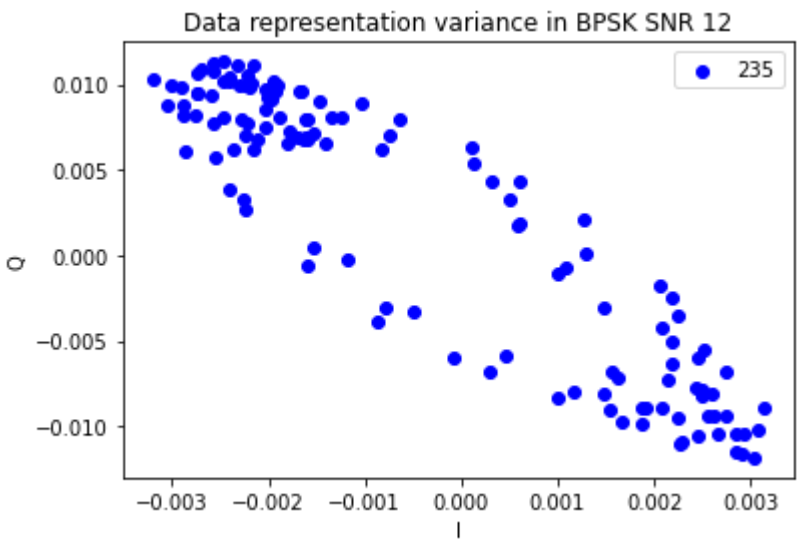
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
235
0.010
0.005
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−0.005
−0.010
Q
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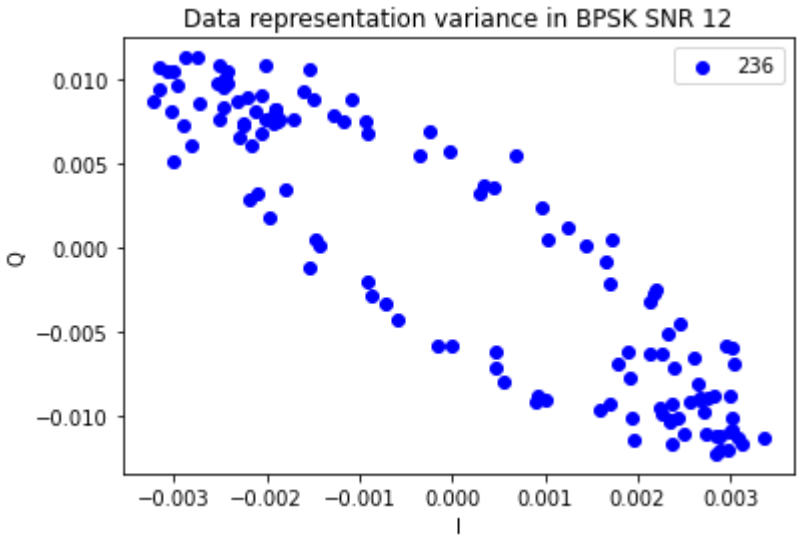
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
236
0.010
0.005
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−0.010
Q
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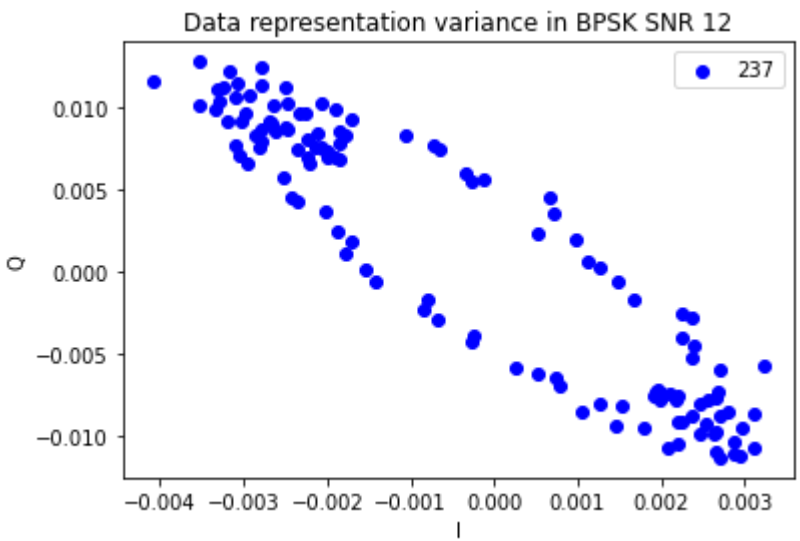
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
237
0.010
0.005
0.000
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−0.010
Q
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−0.002
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0.000
0.001
0.002
0.003
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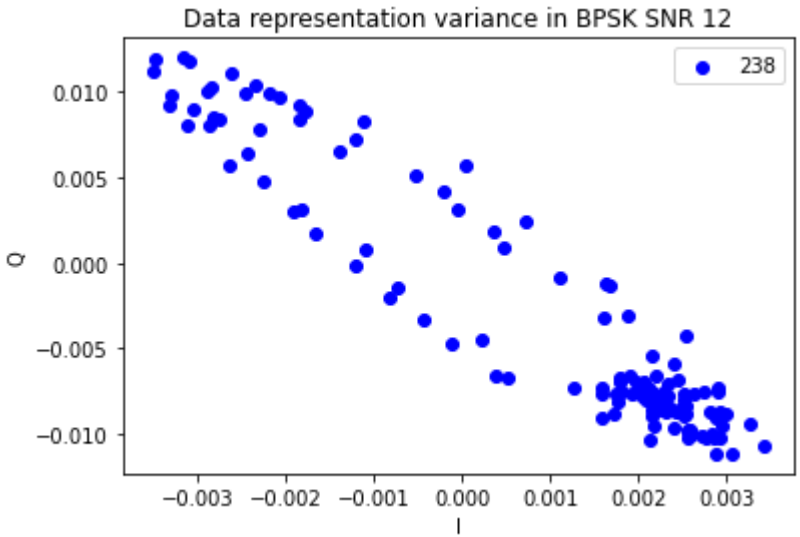
Data representation variance in BPSK SNR 12
238
0.010
0.005
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−0.005
−0.010
Q
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−0.002
−0.001
0.000
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0.002
0.003
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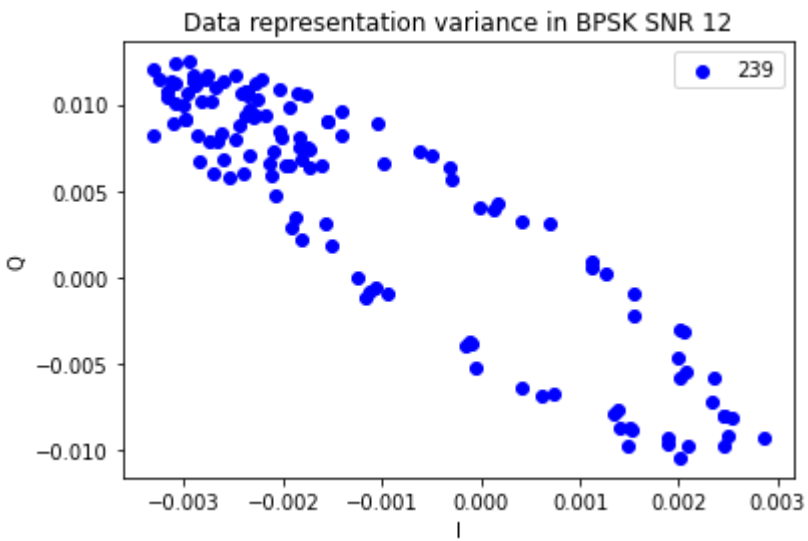
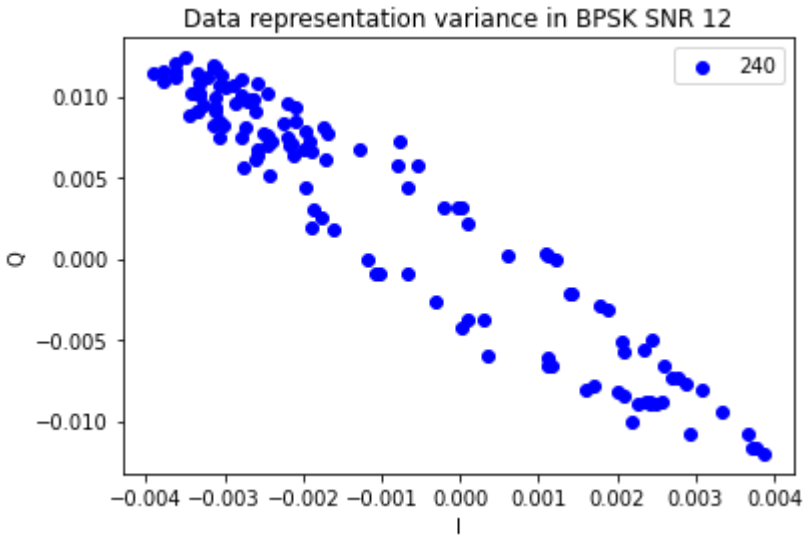

Data representation variance in BPSK SNR 12
239
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
240
0.010
0.005
0.000
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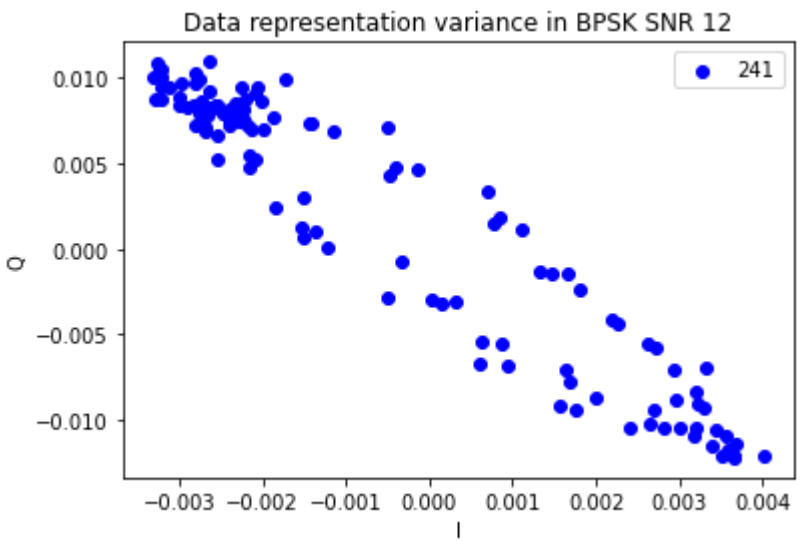
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
241
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0.005
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−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
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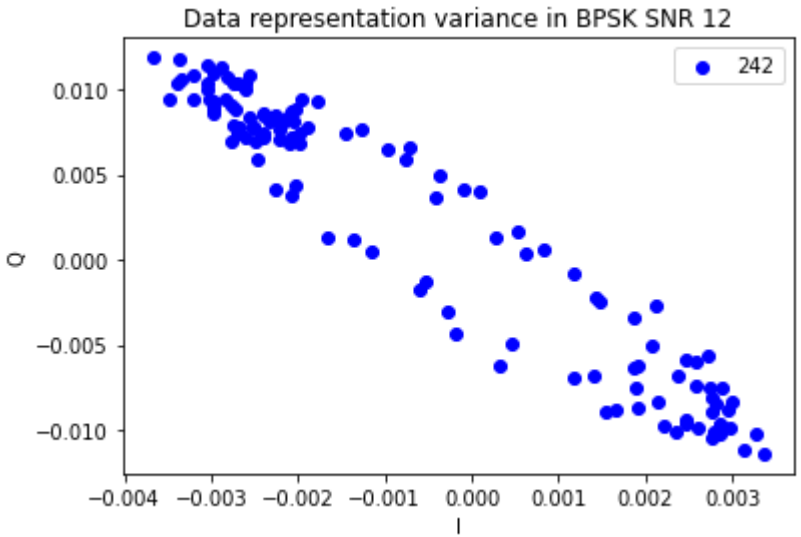
Data representation variance in BPSK SNR 12
242
0.010
0.005
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−0.005
−0.010
Q
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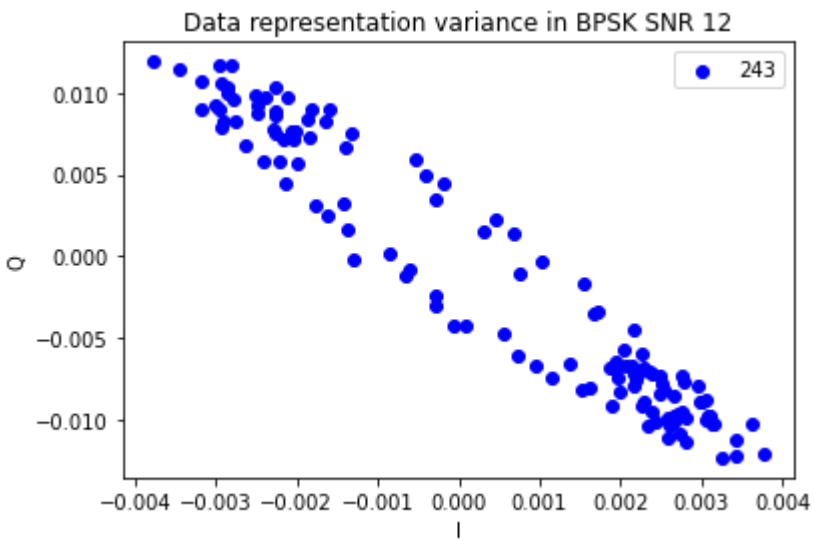
Data representation variance in BPSK SNR 12
243
0.010
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−0.010
Q
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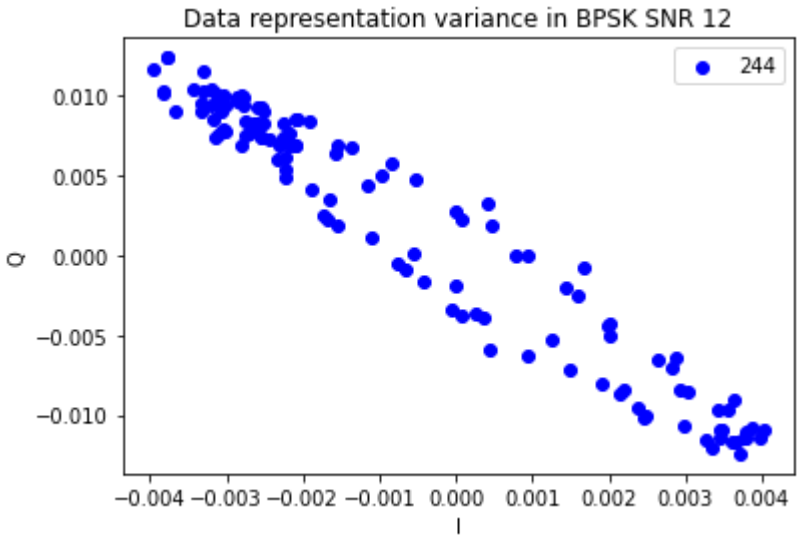
Data representation variance in BPSK SNR 12
244
0.010
0.005
0.000
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−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
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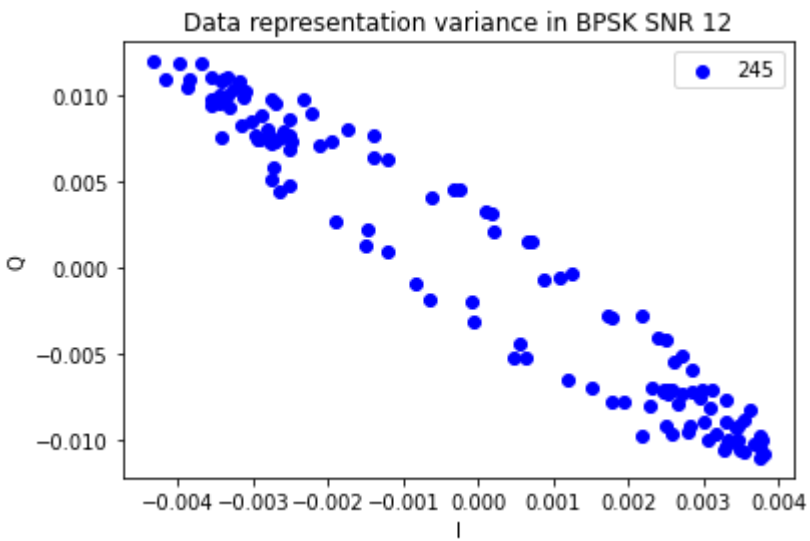
Data representation variance in BPSK SNR 12
245
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
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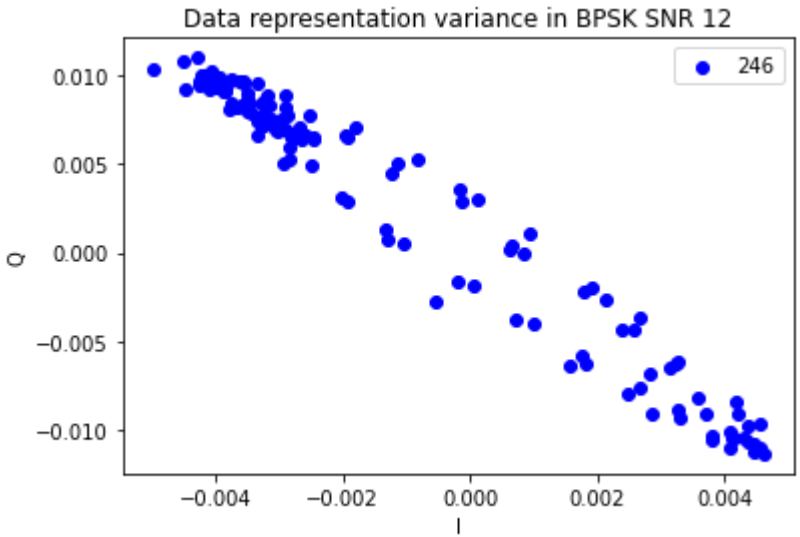
Data representation variance in BPSK SNR 12
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0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
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0.002
0.004
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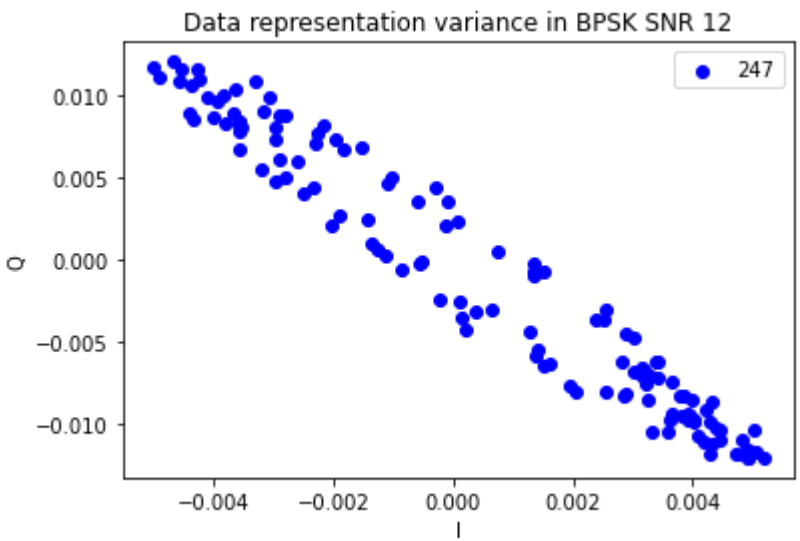
Data representation variance in BPSK SNR 12
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−0.005
−0.010
Q
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−0.002
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0.004
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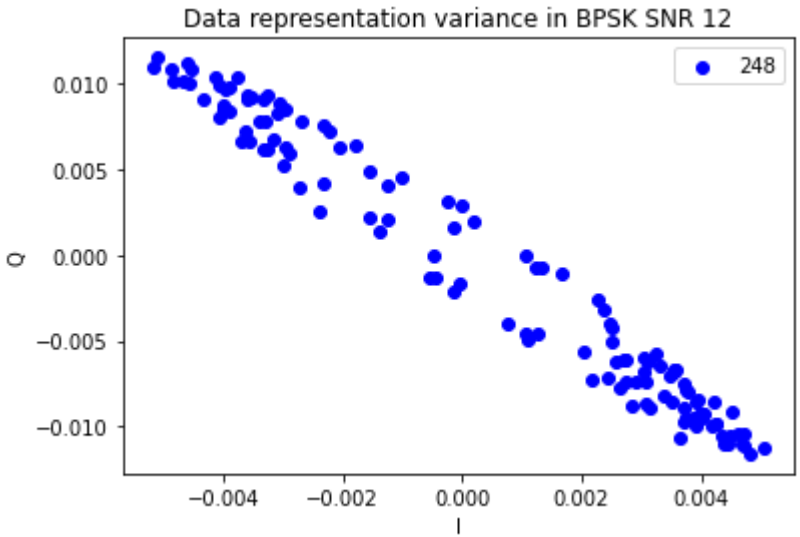
Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
Q
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−0.002
0.000
0.002
0.004
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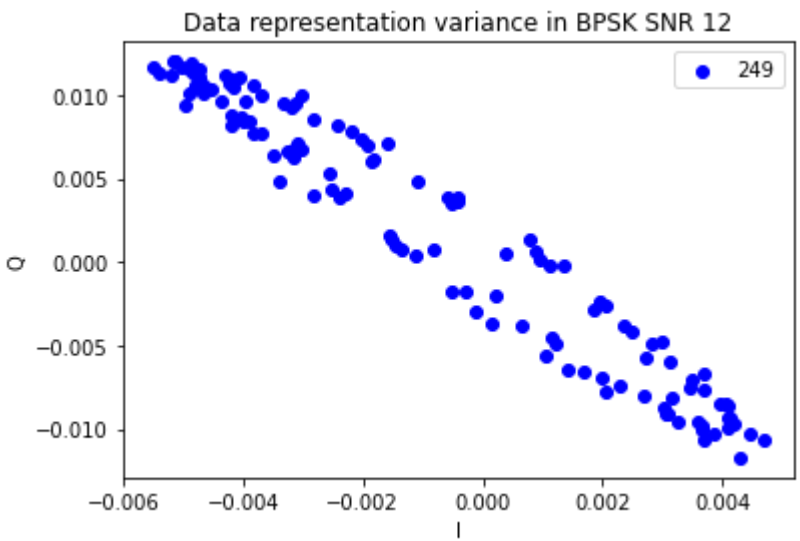
Data representation variance in BPSK SNR 12
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0.010
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0.000
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−0.010
Q
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0.004
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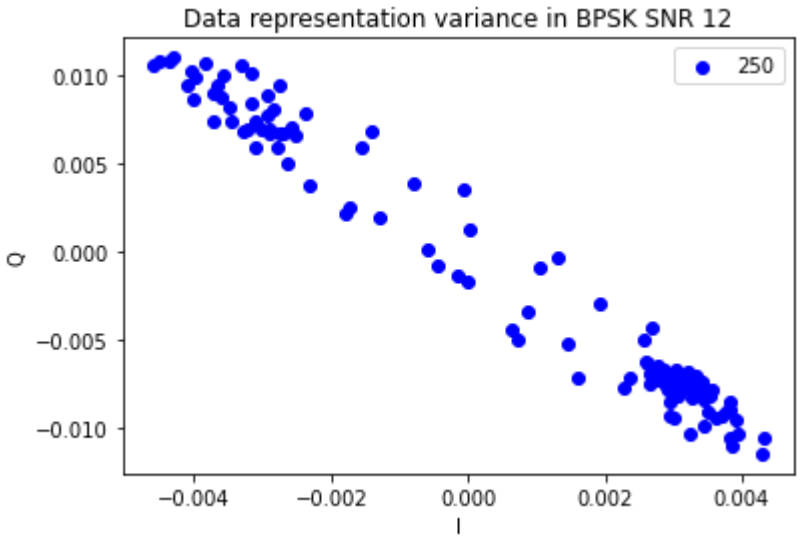
Data representation variance in BPSK SNR 12
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0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
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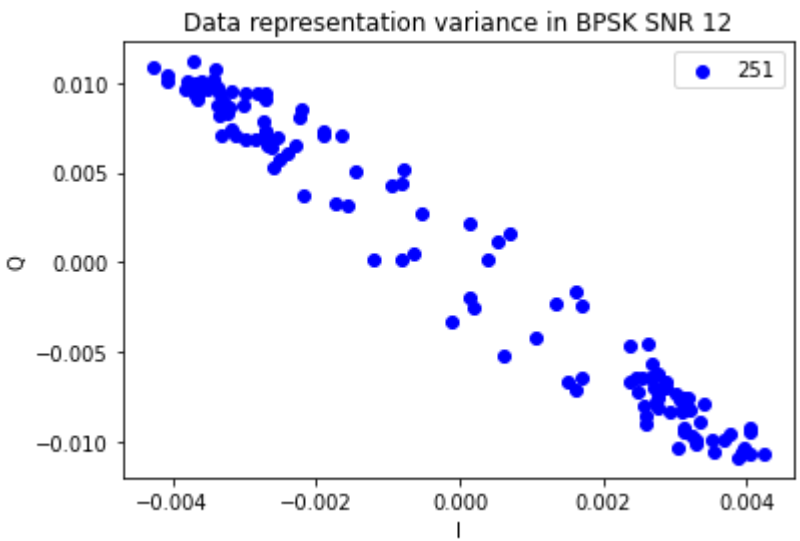
Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
Q
−0.004
−0.002
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0.002
0.004
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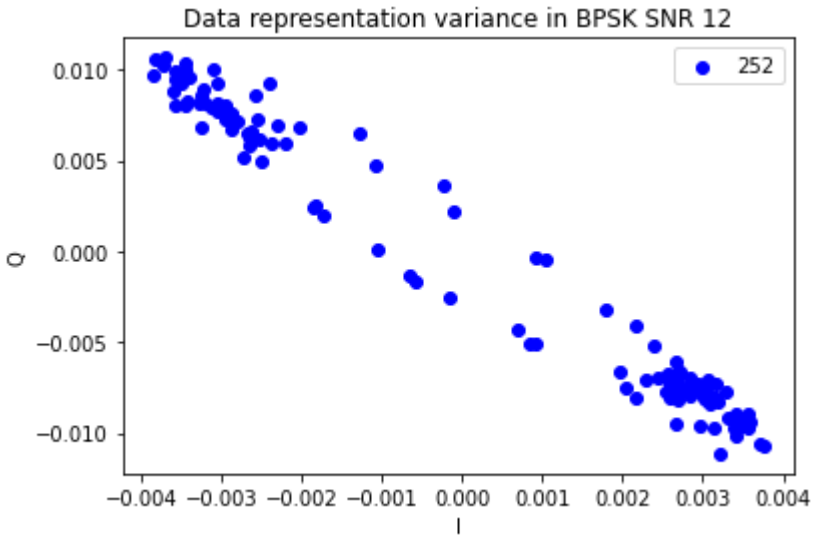
Data representation variance in BPSK SNR 12
252
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
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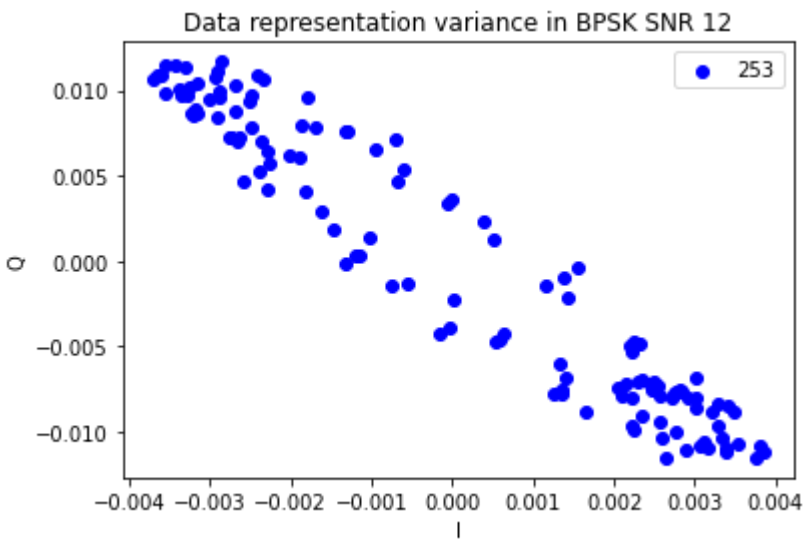
Data representation variance in BPSK SNR 12
253
0.010
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0.000
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−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
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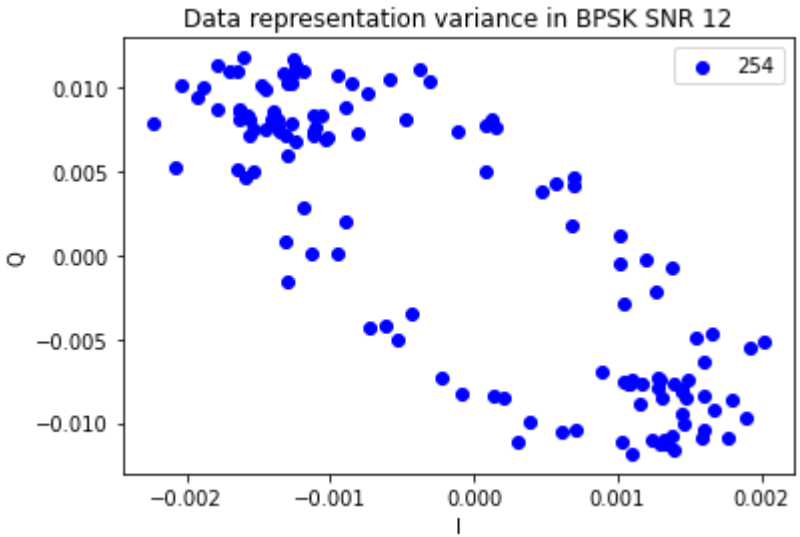
Data representation variance in BPSK SNR 12
254
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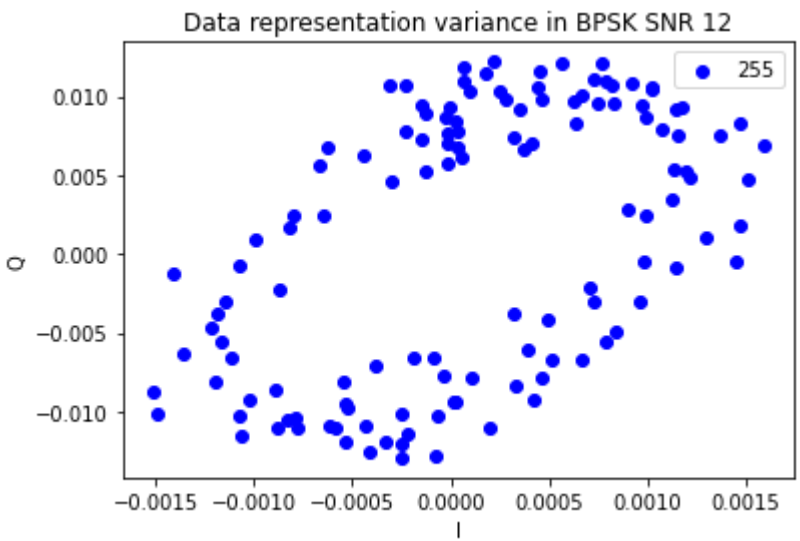
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
255
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.0010
−0.0005
0.0000
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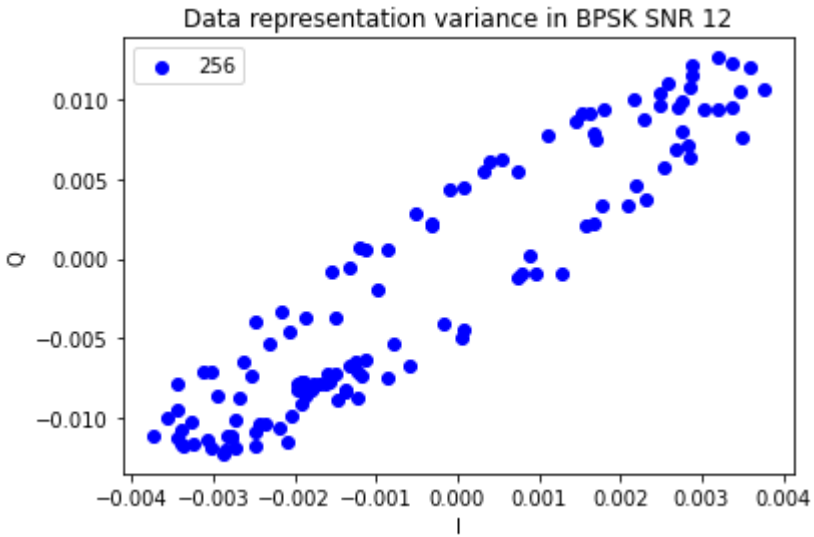
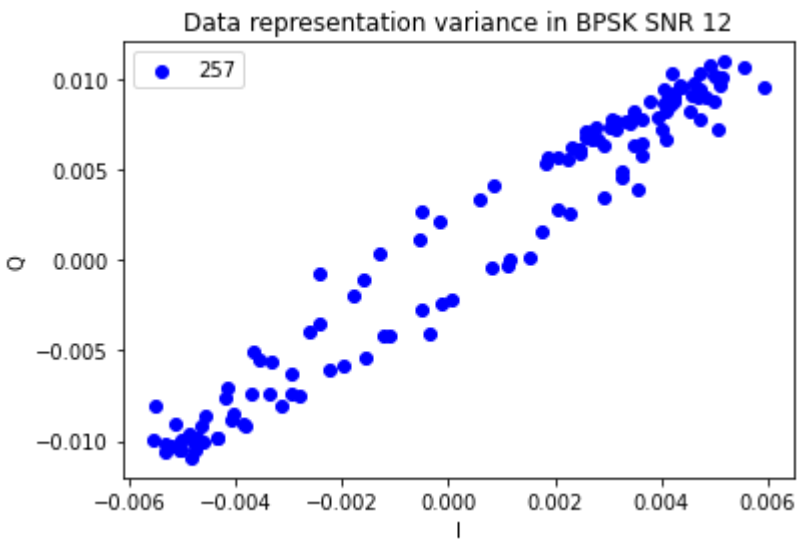
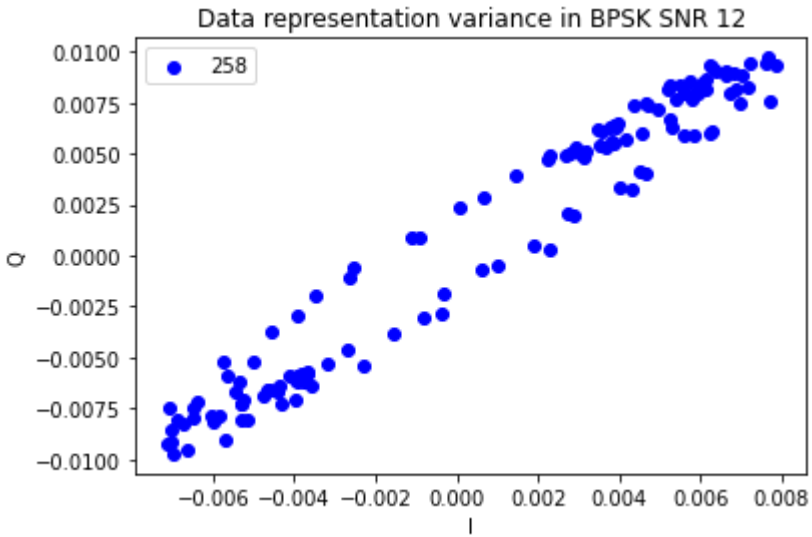
0.0010
0.0015
I


Data representation variance in BPSK SNR 12
256
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
257
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
258
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
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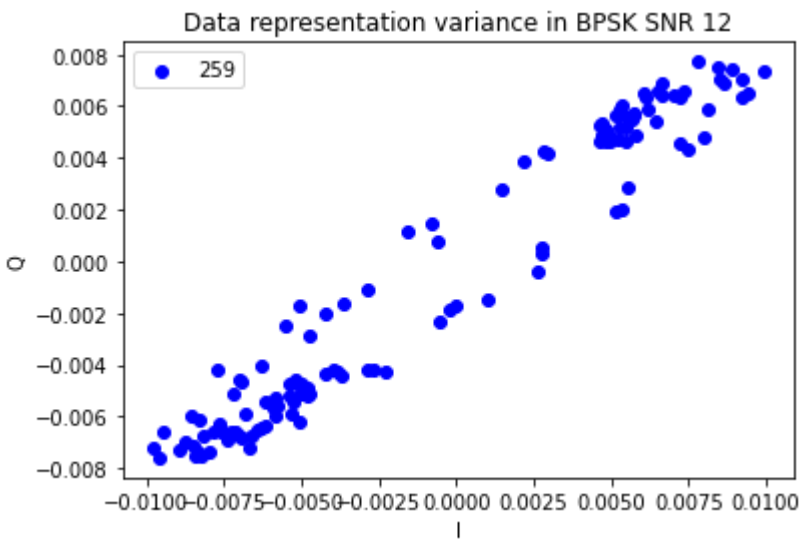
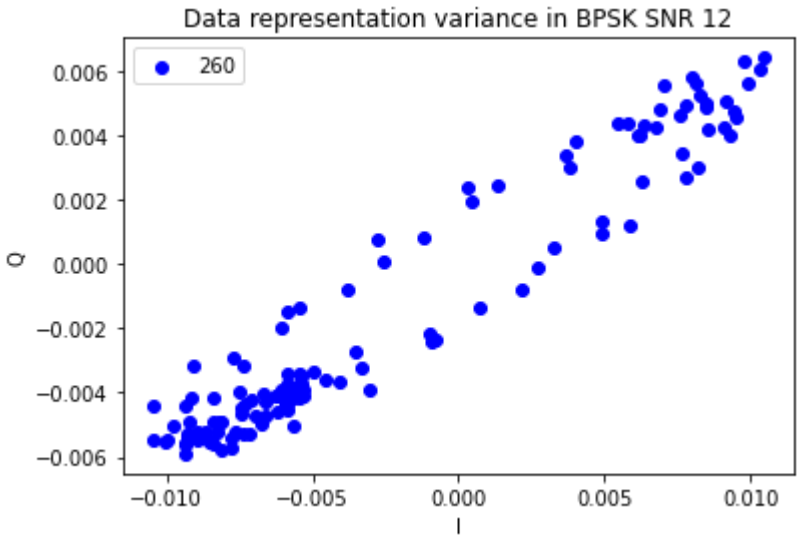
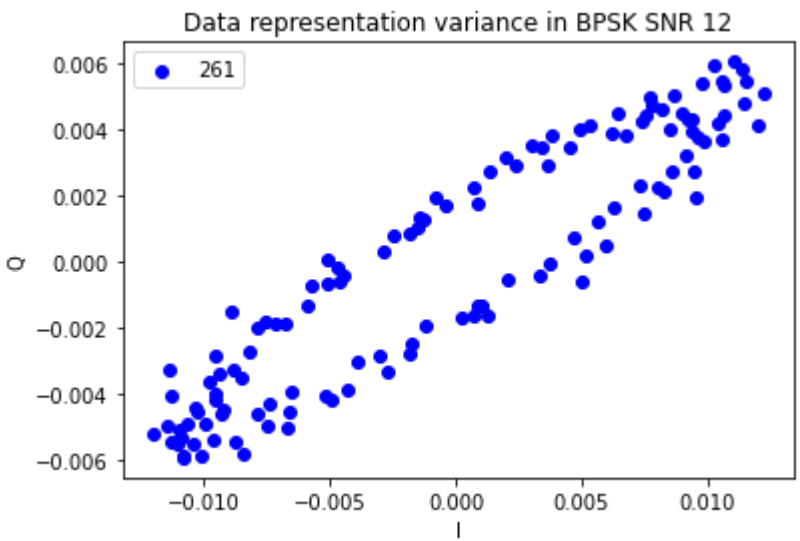
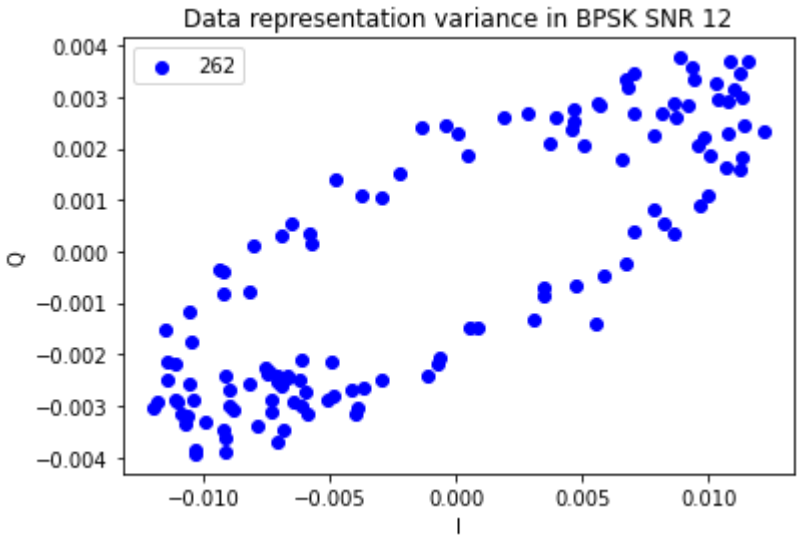
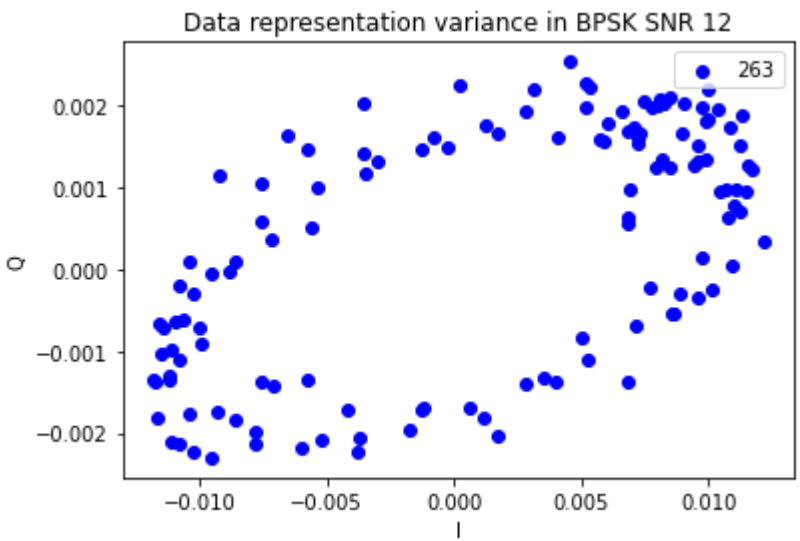
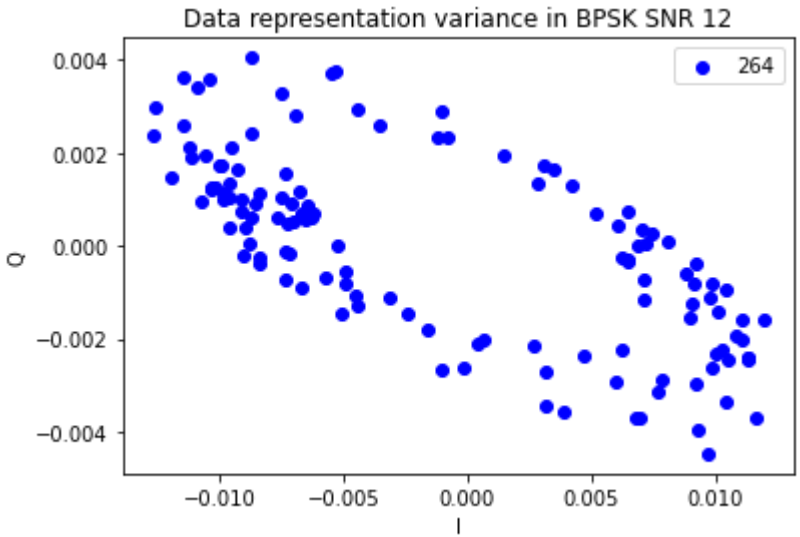

Data representation variance in BPSK SNR 12
259
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

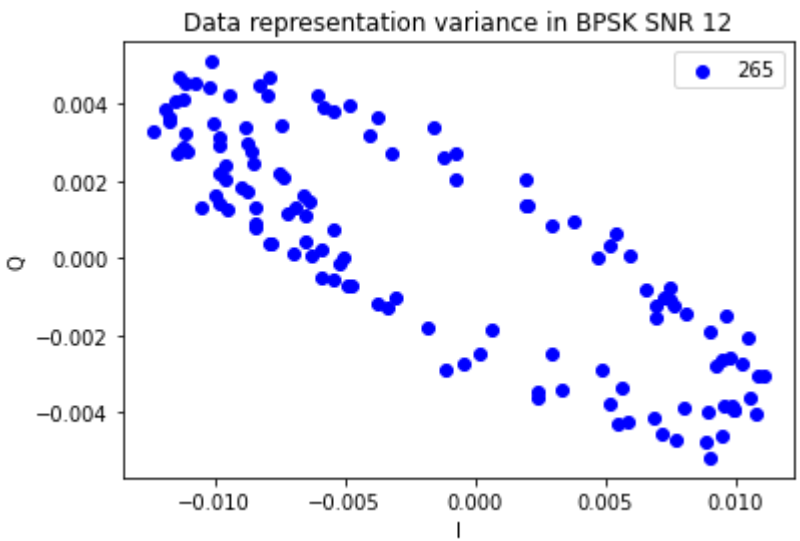

Data representation variance in BPSK SNR 12
260
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

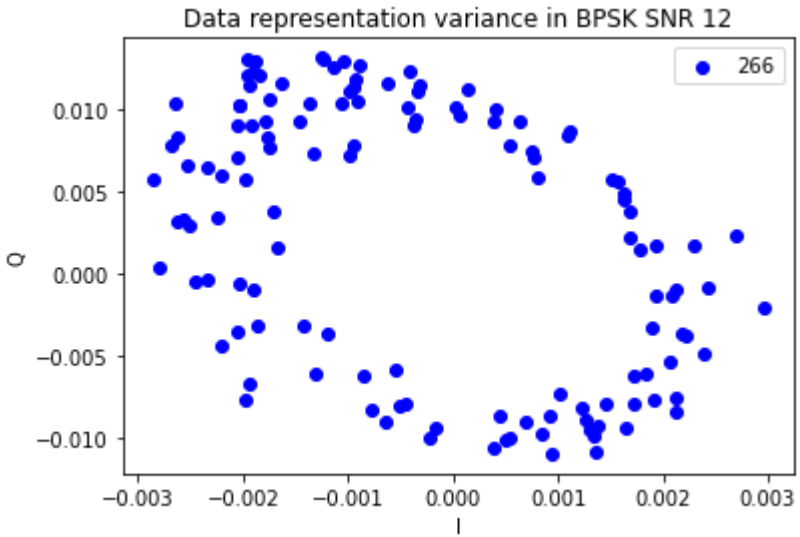

Data representation variance in BPSK SNR 12
261
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

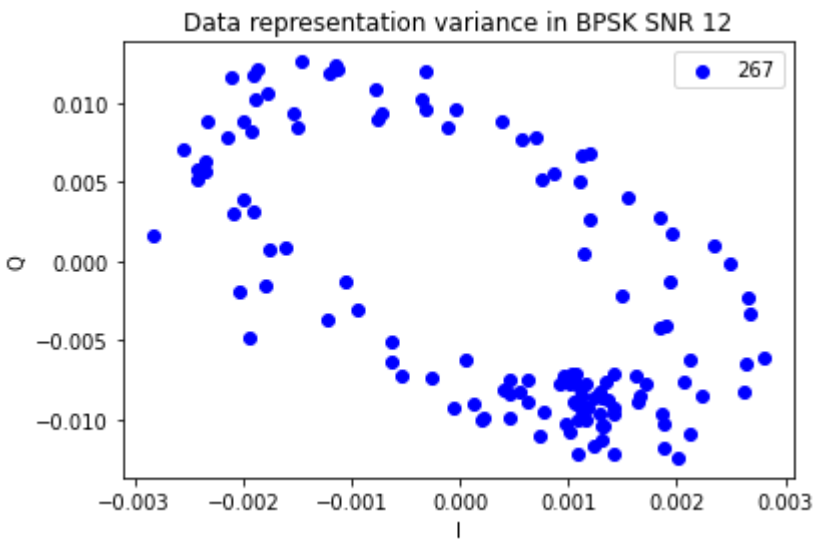

Data representation variance in BPSK SNR 12
262
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

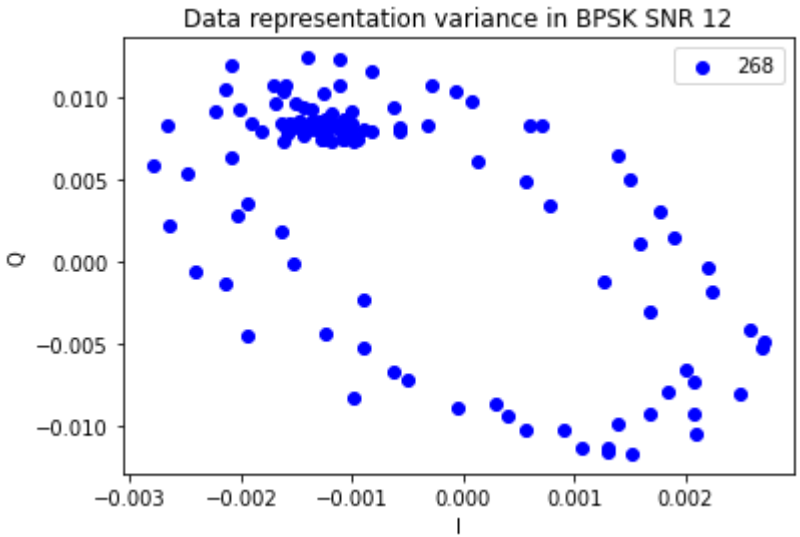

Data representation variance in BPSK SNR 12
263
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

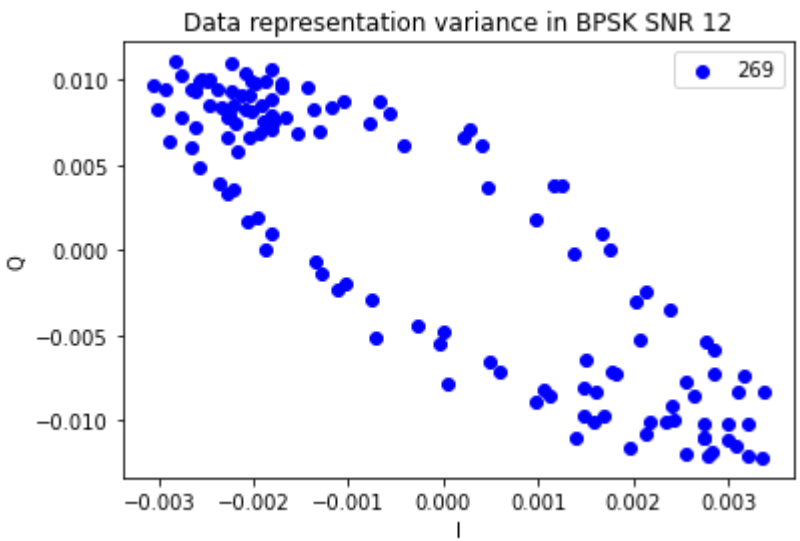

Data representation variance in BPSK SNR 12
264
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

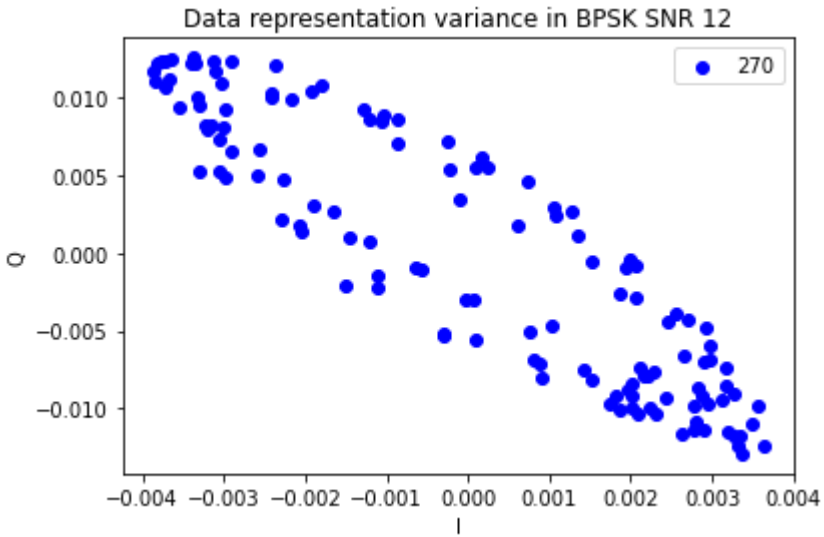

Data representation variance in BPSK SNR 12
265
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

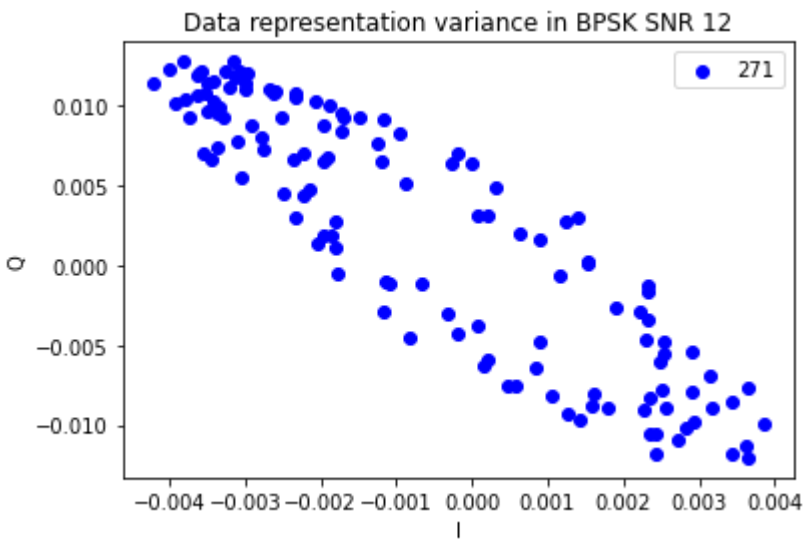

Data representation variance in BPSK SNR 12
266
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

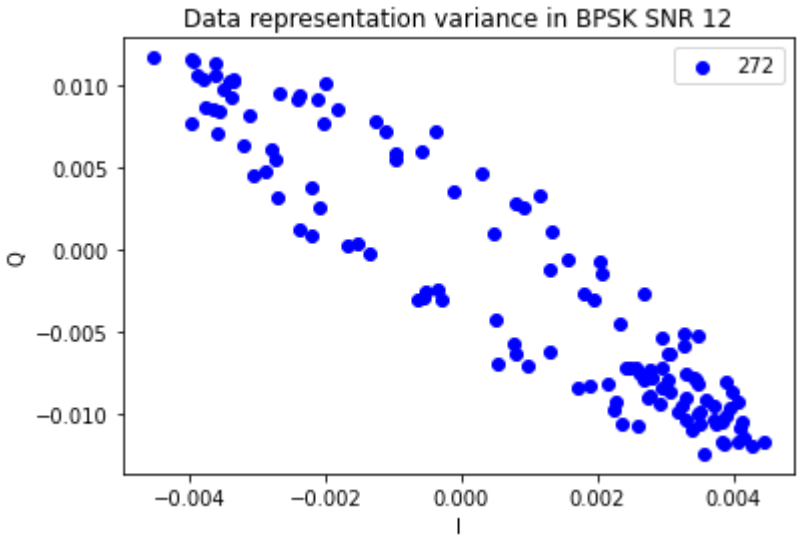

Data representation variance in BPSK SNR 12
267
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

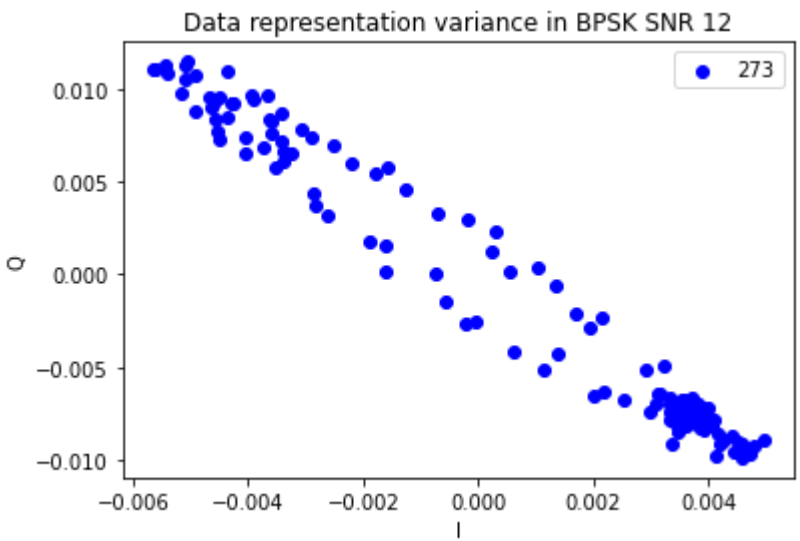

Data representation variance in BPSK SNR 12
268
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

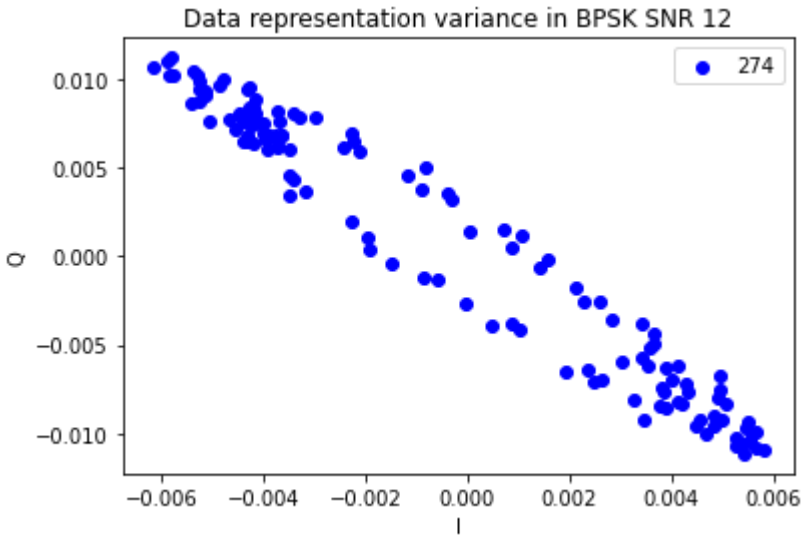

Data representation variance in BPSK SNR 12
269
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

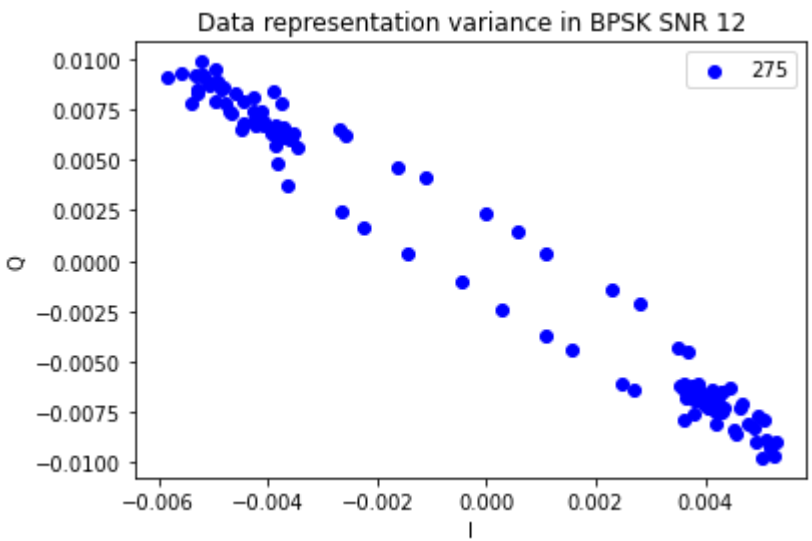

Data representation variance in BPSK SNR 12
270
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

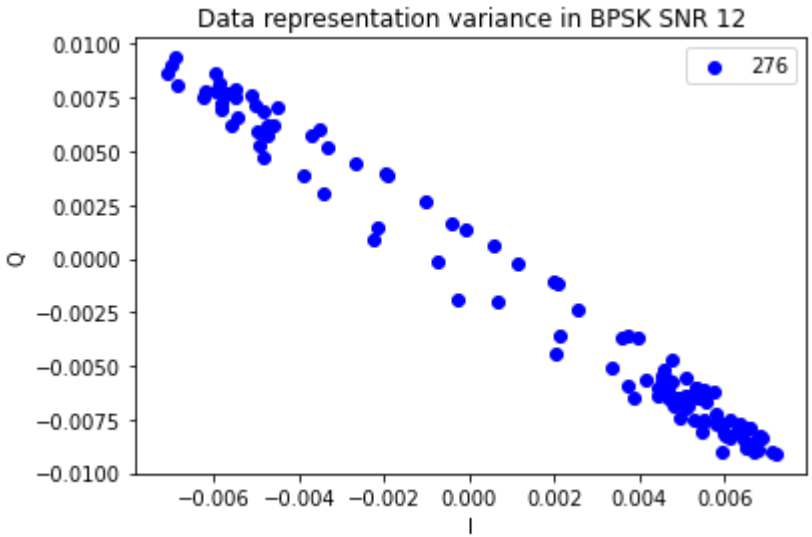

Data representation variance in BPSK SNR 12
271
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

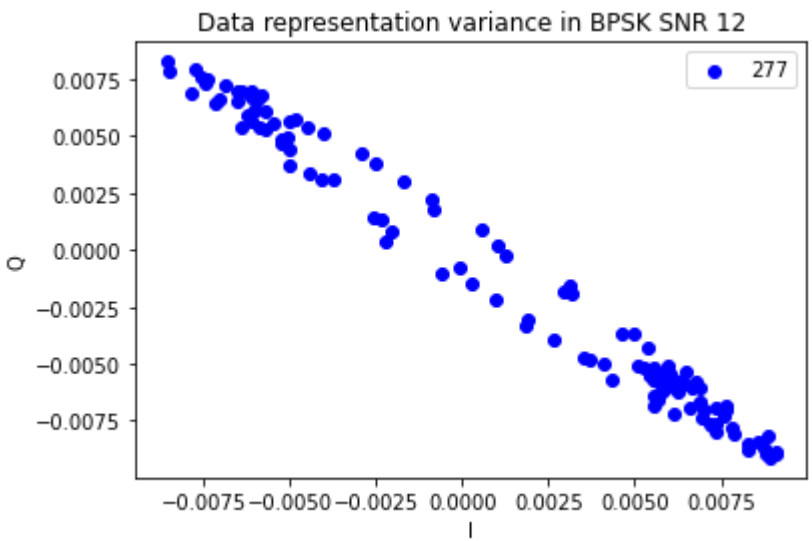

Data representation variance in BPSK SNR 12
272
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

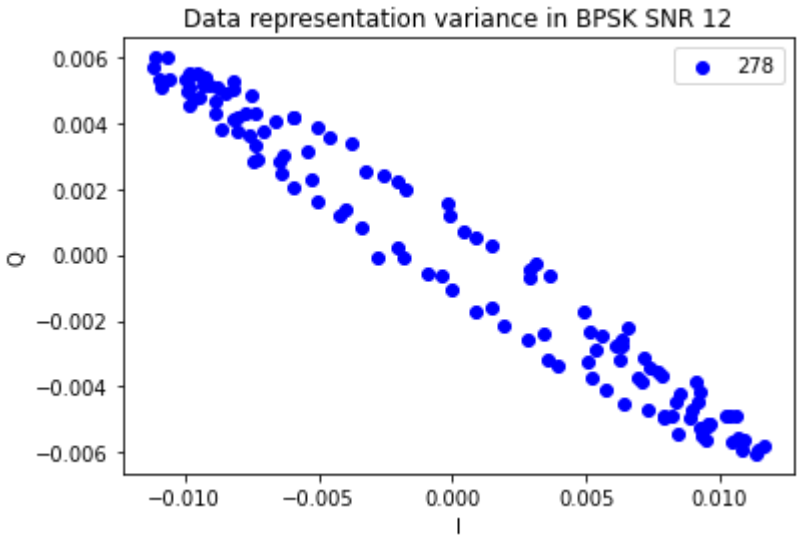

Data representation variance in BPSK SNR 12
273
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I

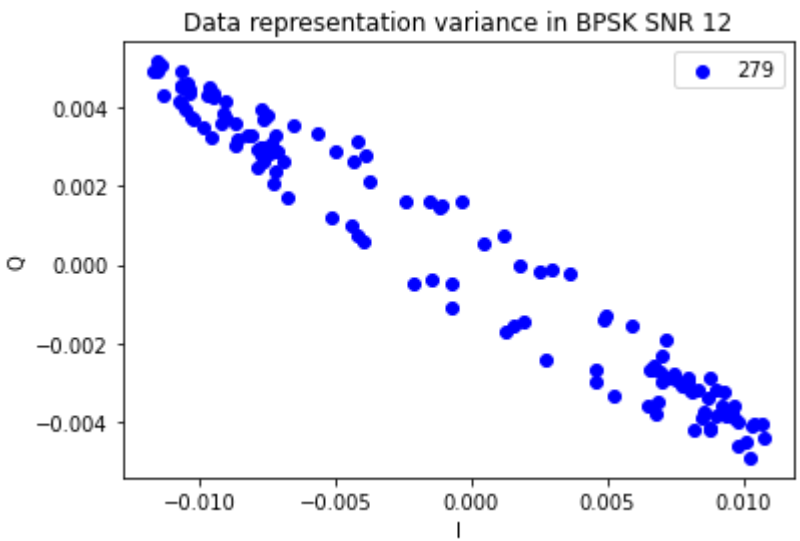

Data representation variance in BPSK SNR 12
274
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

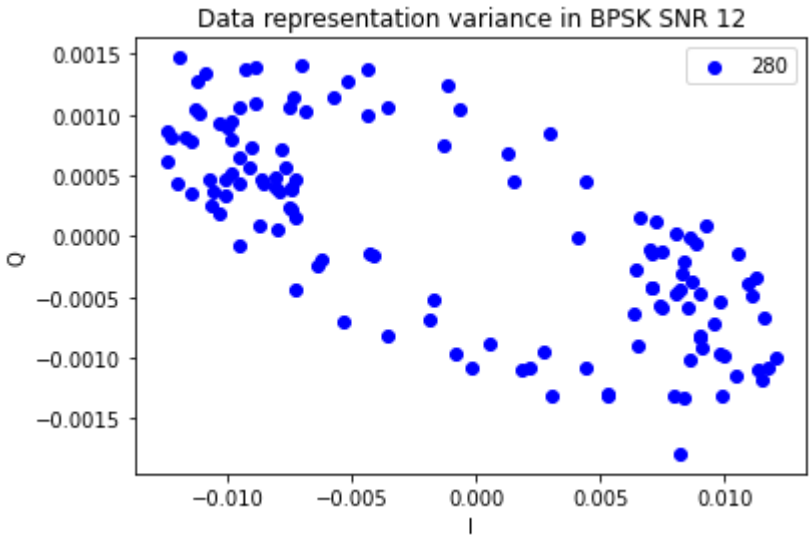

Data representation variance in BPSK SNR 12
275
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I

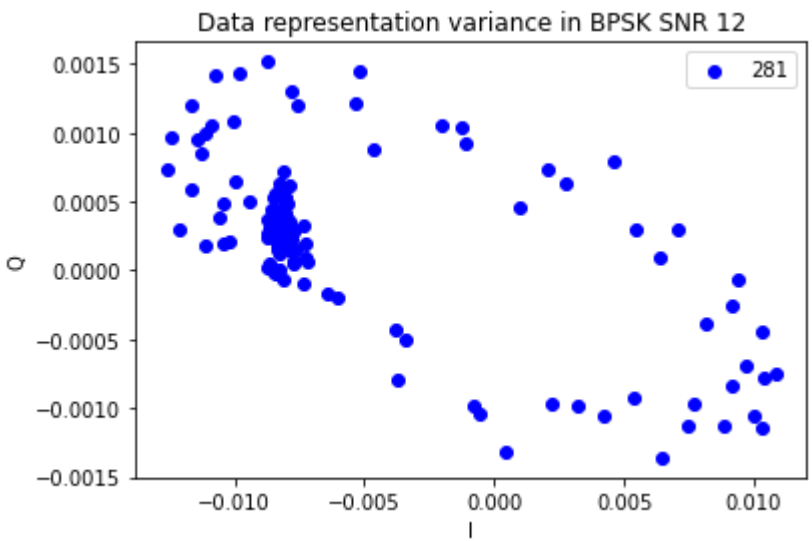

Data representation variance in BPSK SNR 12
276
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

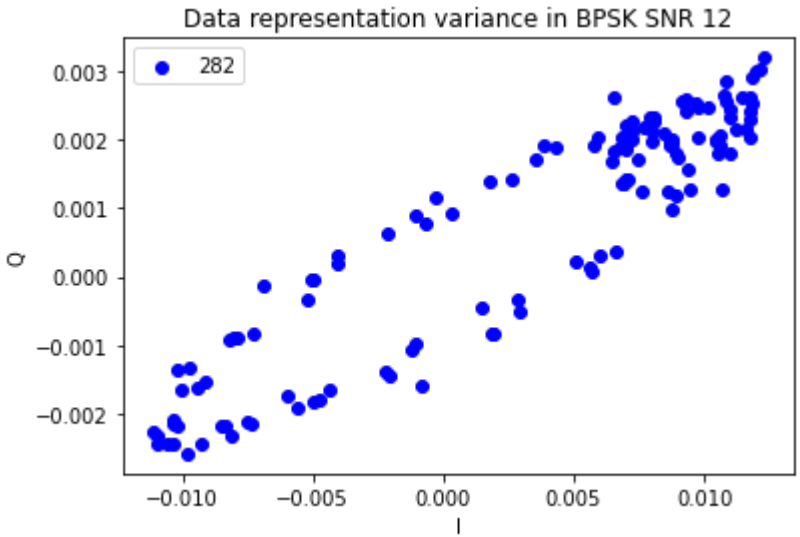

Data representation variance in BPSK SNR 12
277
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
I

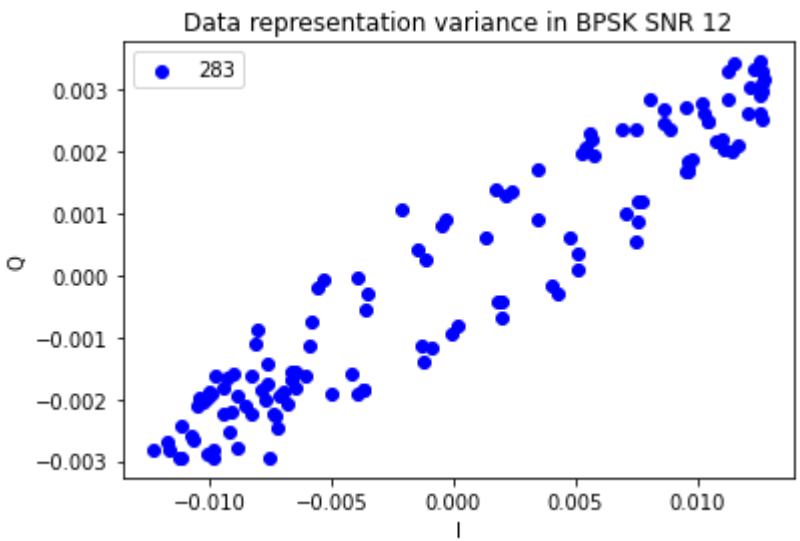

Data representation variance in BPSK SNR 12
278
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

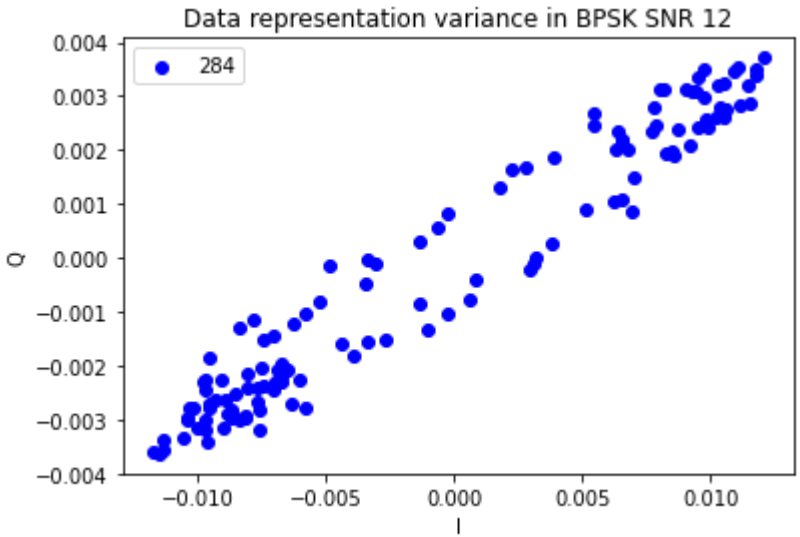

Data representation variance in BPSK SNR 12
279
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

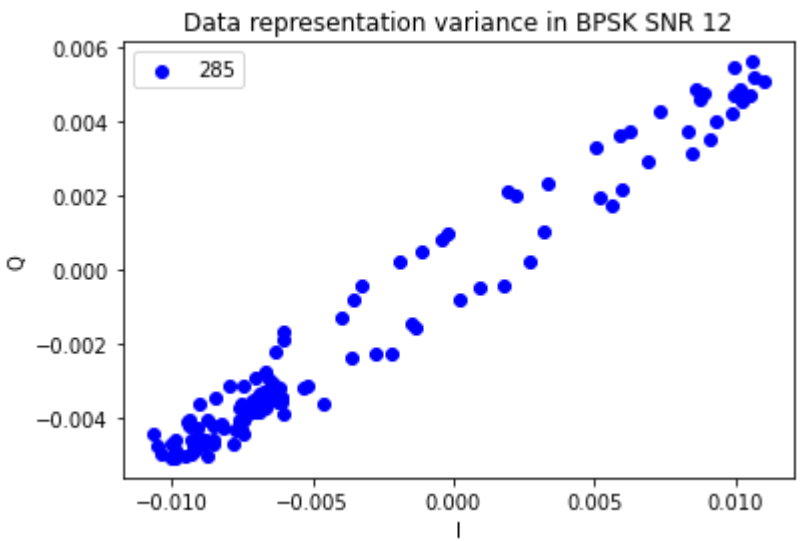

Data representation variance in BPSK SNR 12
280
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

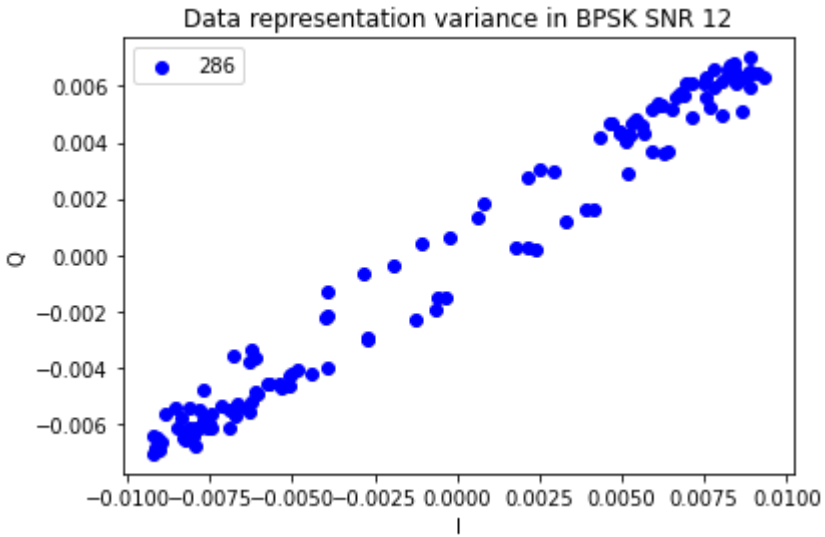

Data representation variance in BPSK SNR 12
281
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

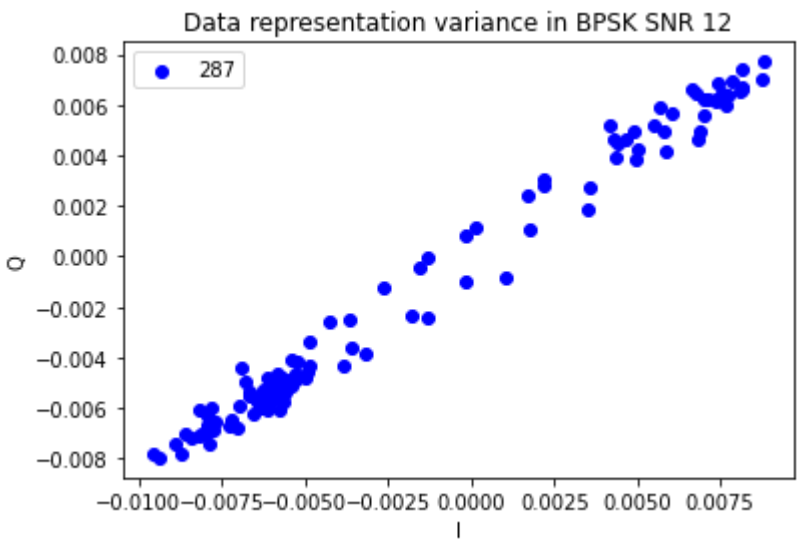

Data representation variance in BPSK SNR 12
282
0.003
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

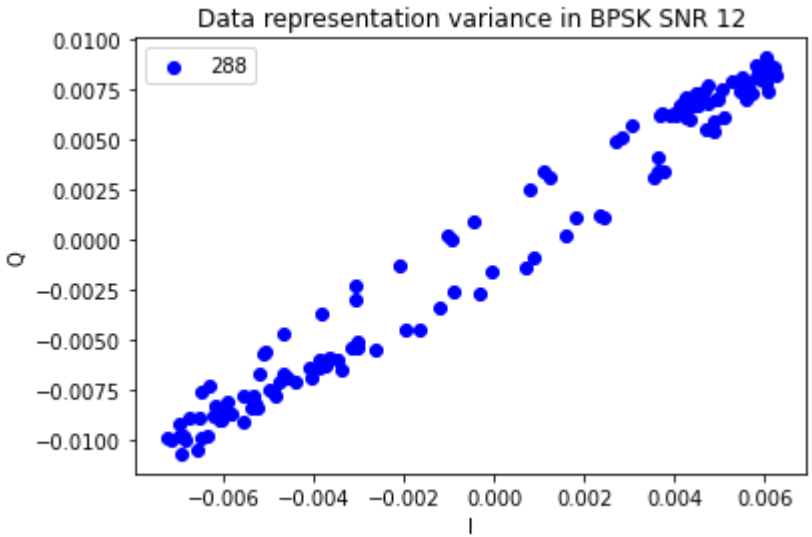

Data representation variance in BPSK SNR 12
283
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

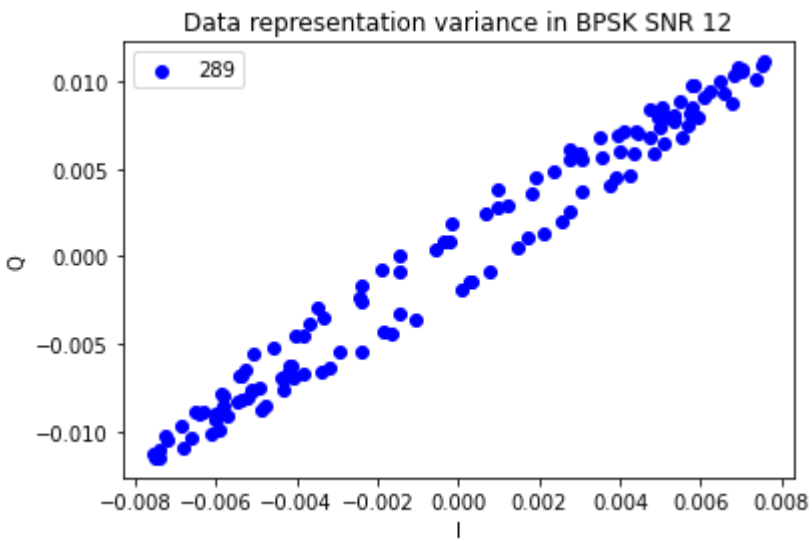

Data representation variance in BPSK SNR 12
284
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

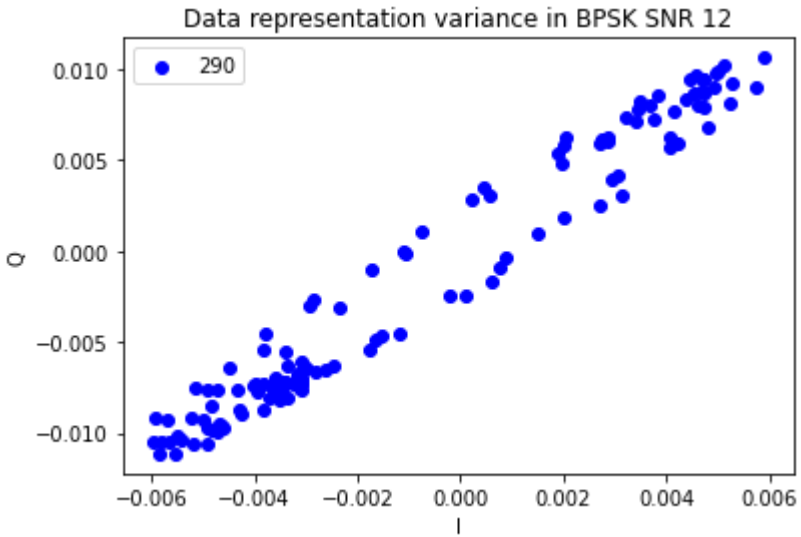

Data representation variance in BPSK SNR 12
285
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

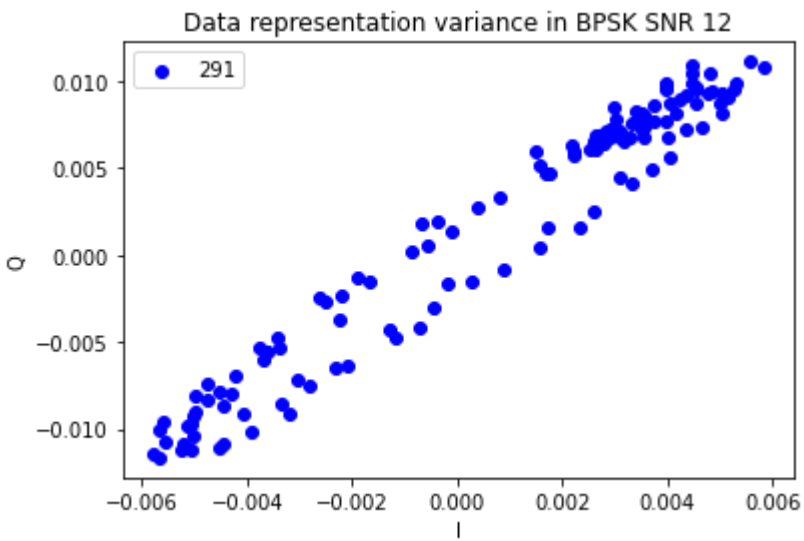

Data representation variance in BPSK SNR 12
286
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

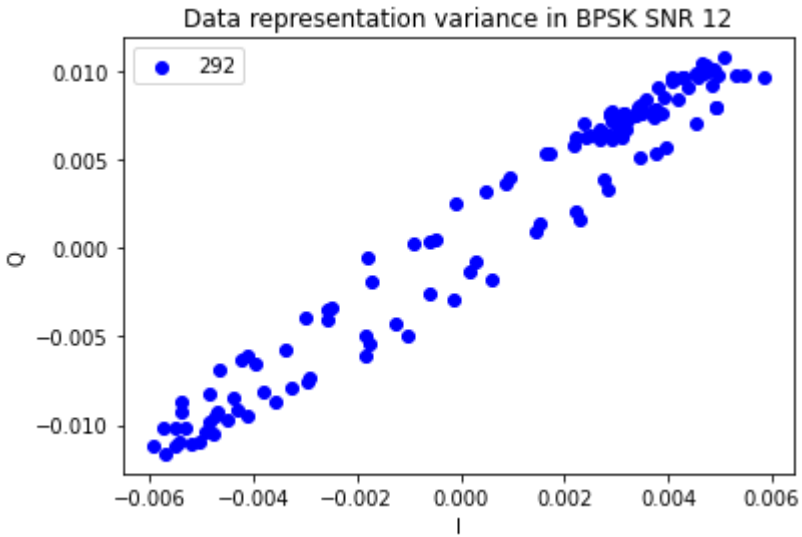

Data representation variance in BPSK SNR 12
287
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

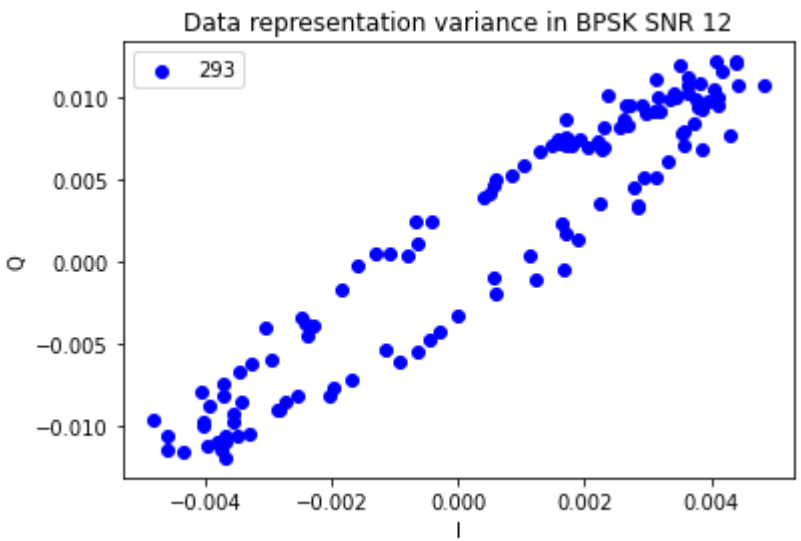

Data representation variance in BPSK SNR 12
288
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

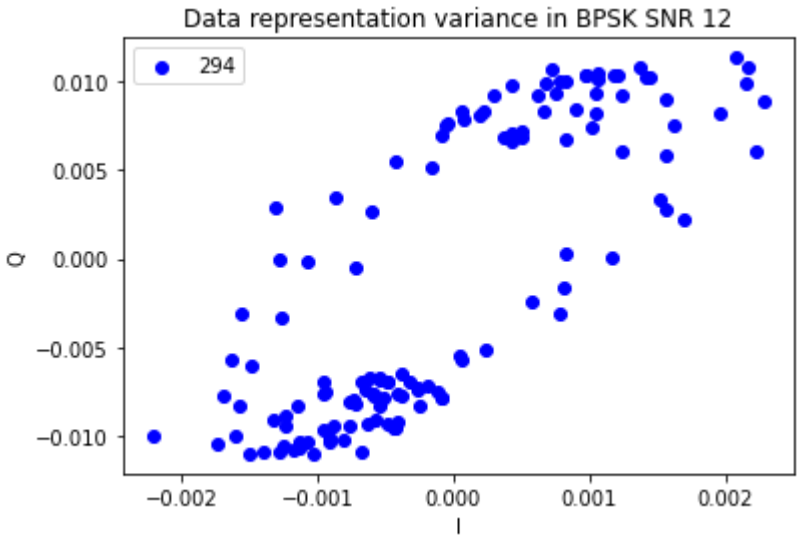

Data representation variance in BPSK SNR 12
289
0.010
0.005
0.000
−0.005
−0.010
Q
−0.008
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I

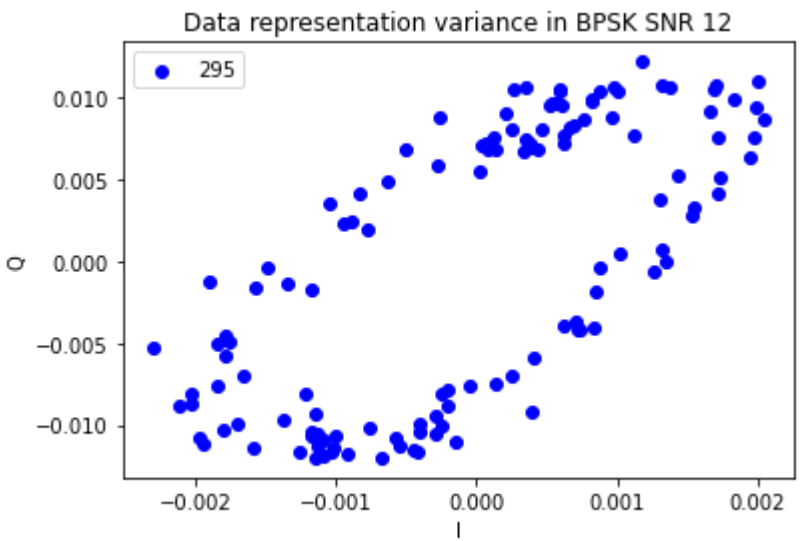

Data representation variance in BPSK SNR 12
290
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

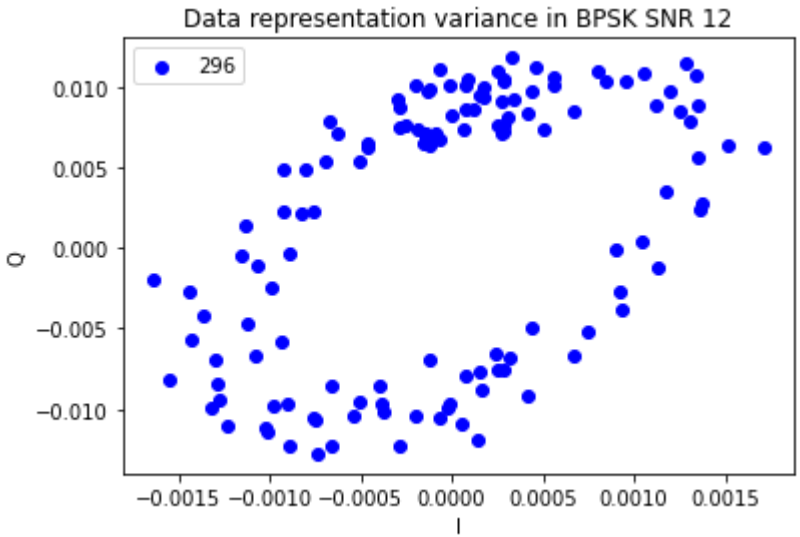

Data representation variance in BPSK SNR 12
291
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

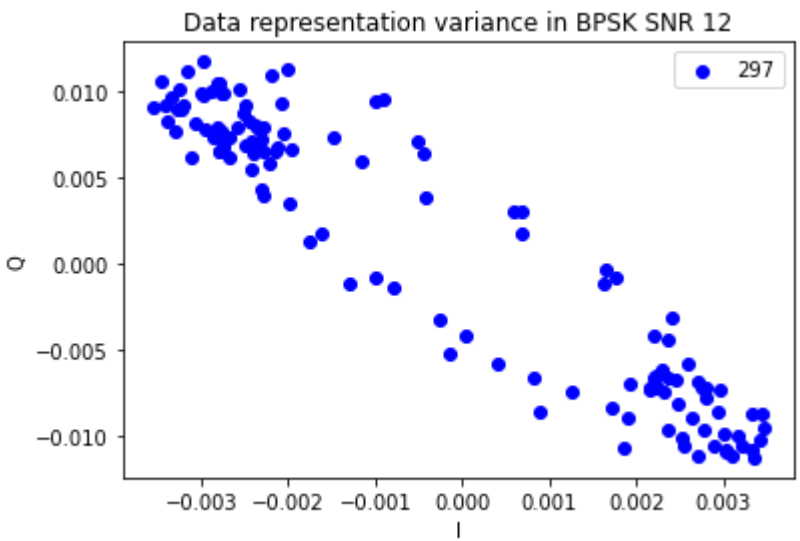

Data representation variance in BPSK SNR 12
292
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

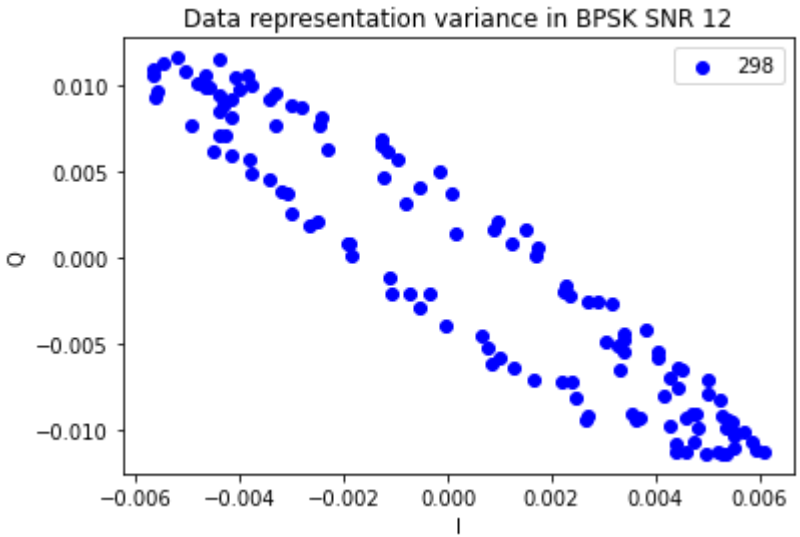

Data representation variance in BPSK SNR 12
293
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

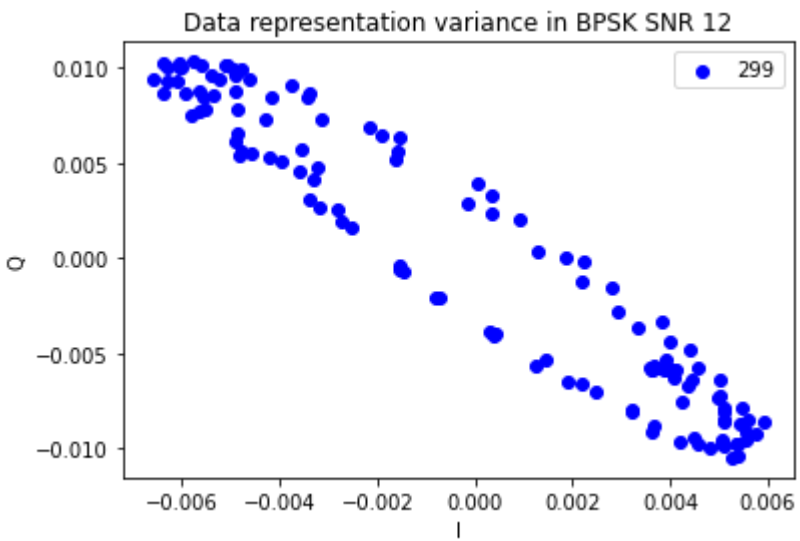

Data representation variance in BPSK SNR 12
294
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

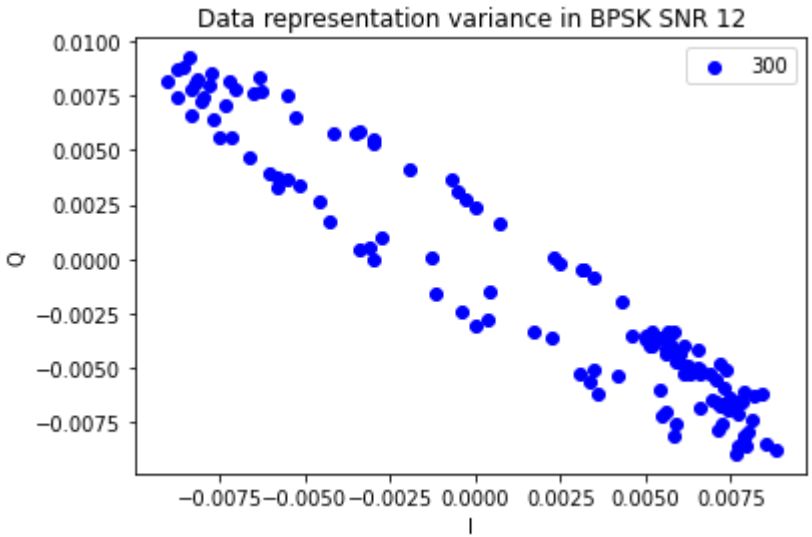

Data representation variance in BPSK SNR 12
295
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

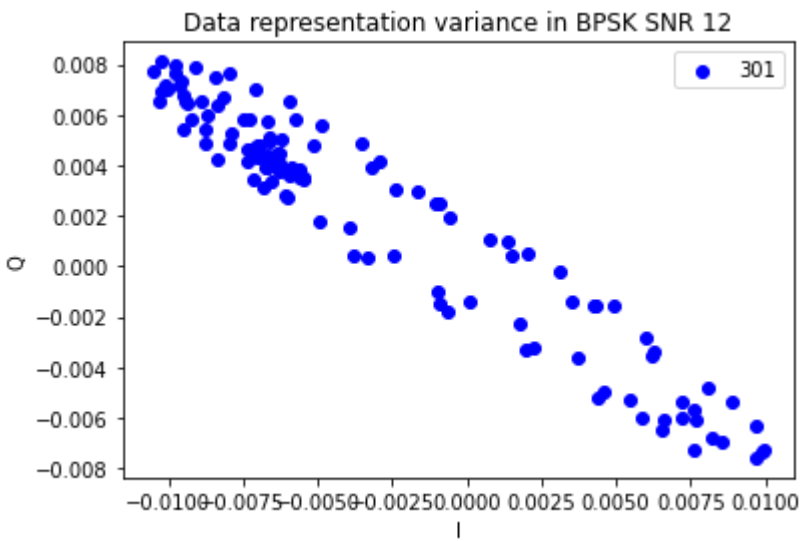

Data representation variance in BPSK SNR 12
296
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

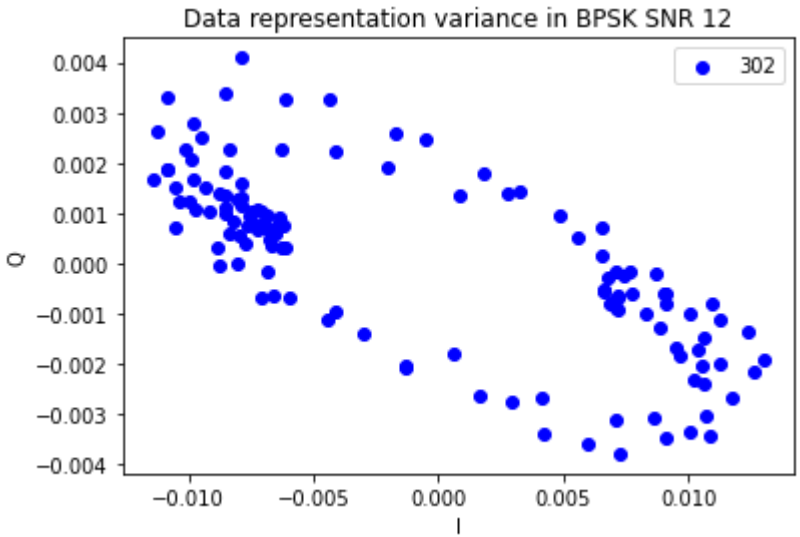

Data representation variance in BPSK SNR 12
297
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

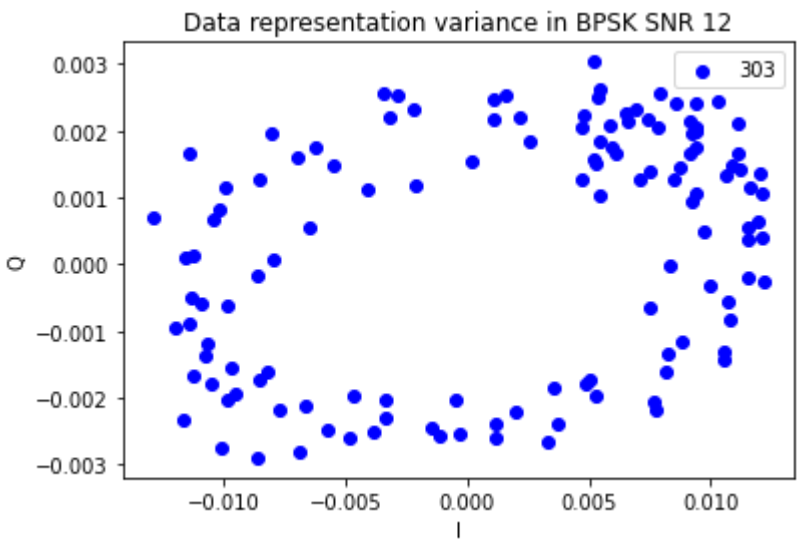

Data representation variance in BPSK SNR 12
298
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

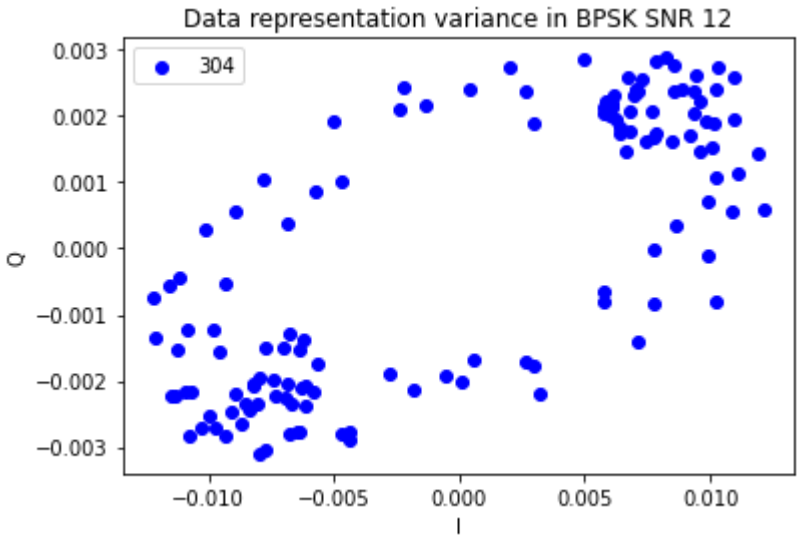

Data representation variance in BPSK SNR 12
299
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

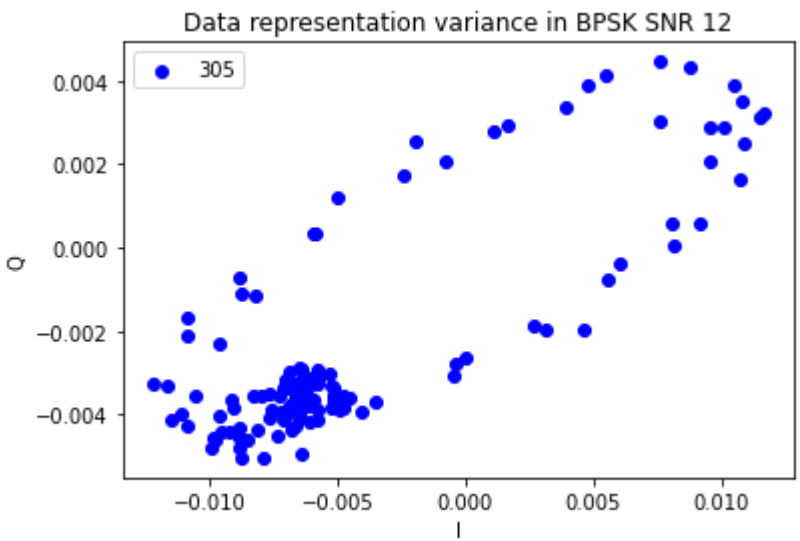

Data representation variance in BPSK SNR 12
300
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
301
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
302
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
303
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
304
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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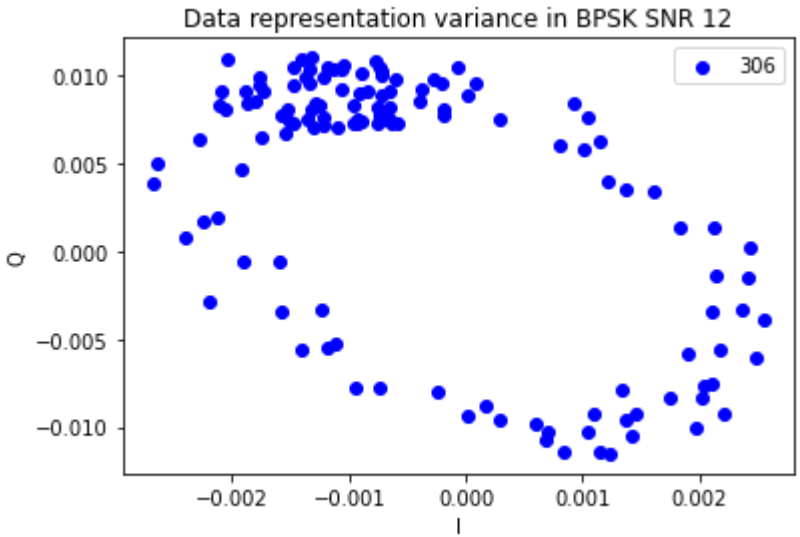
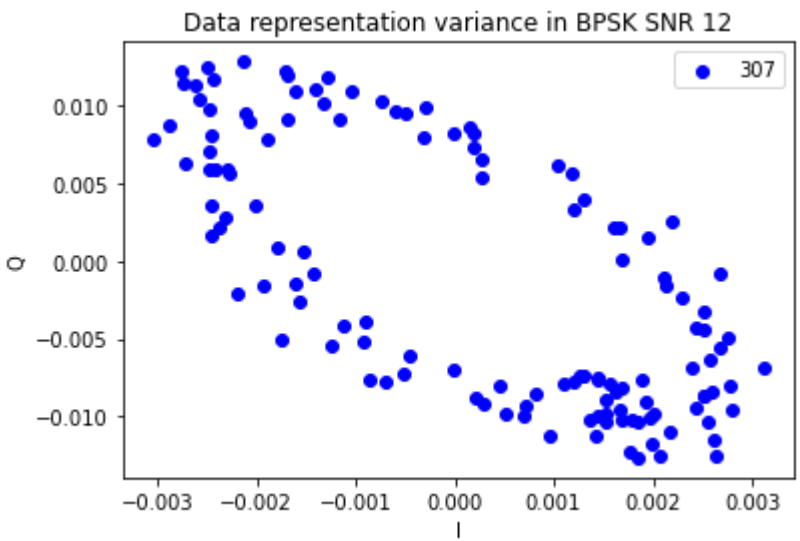
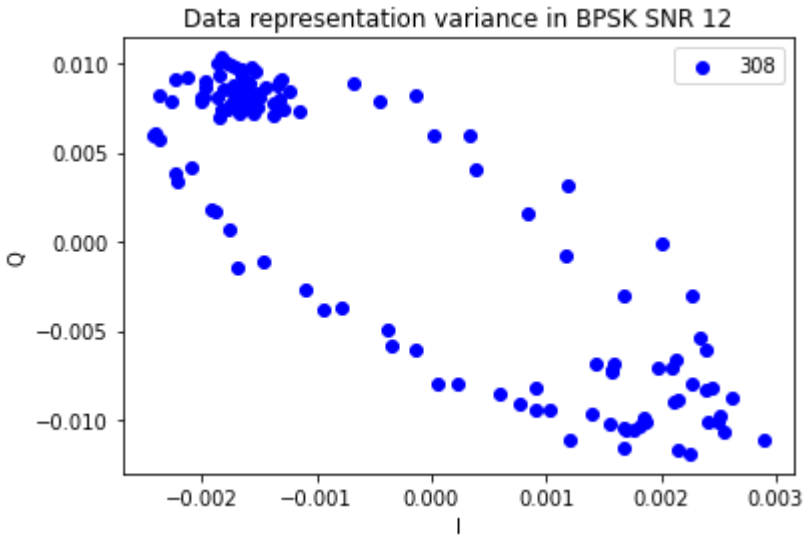
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
306
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
307
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
308
0.010
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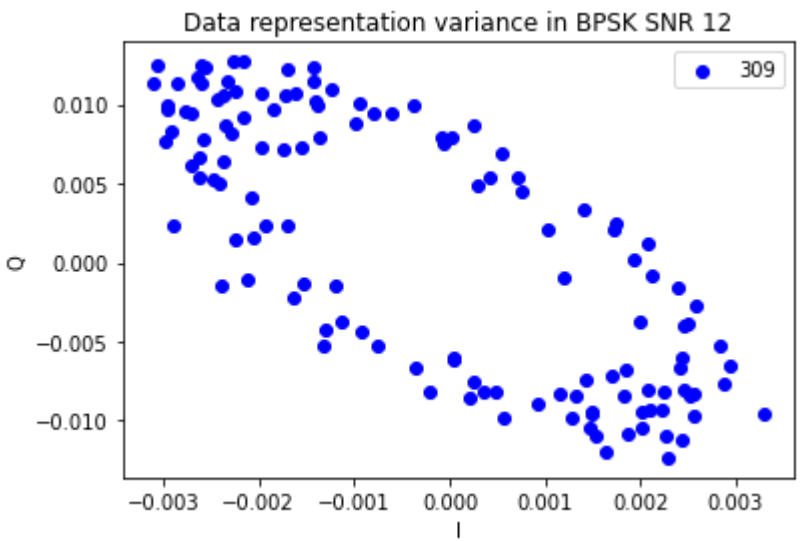
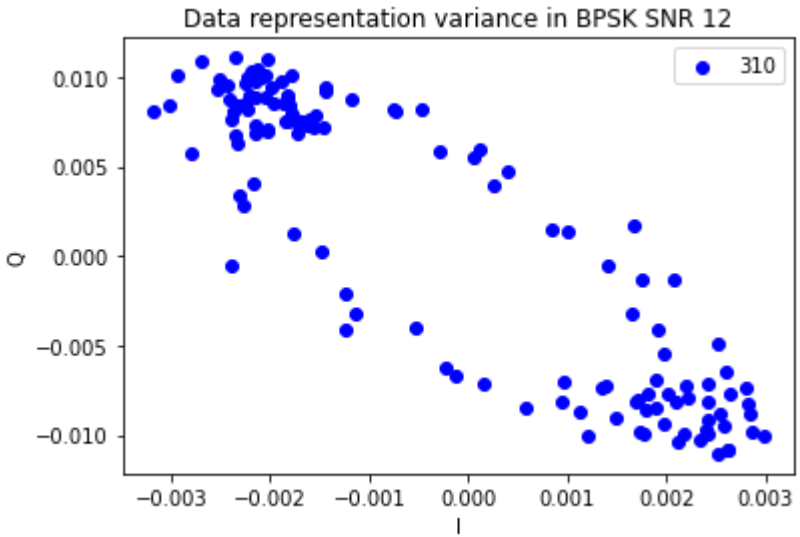
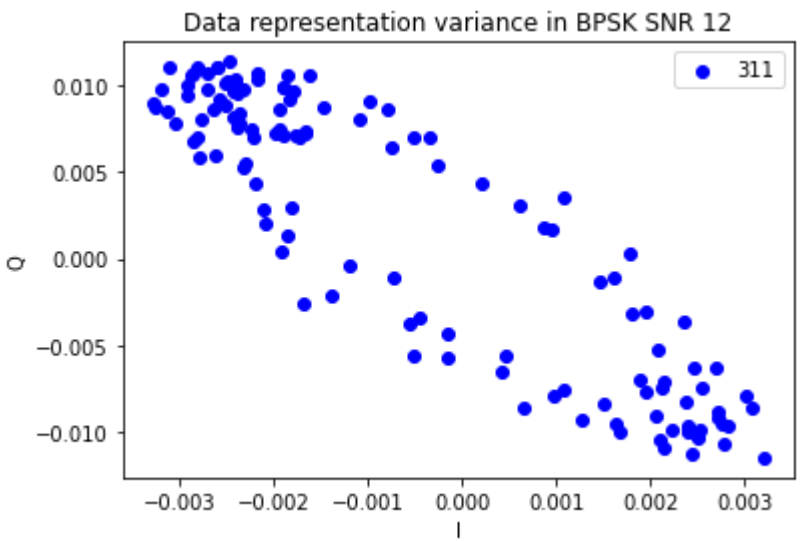
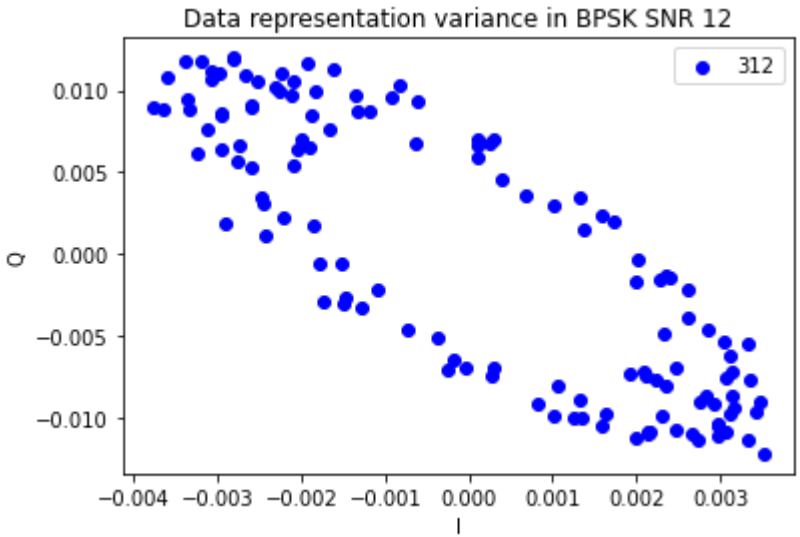
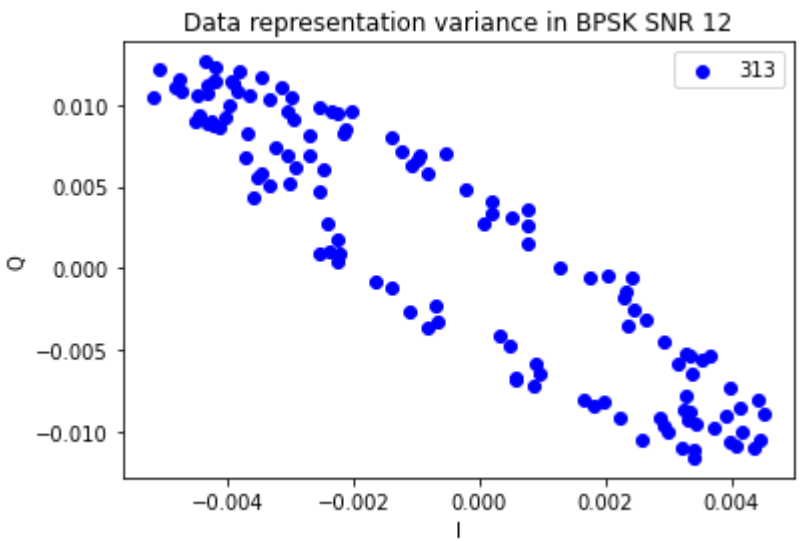
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

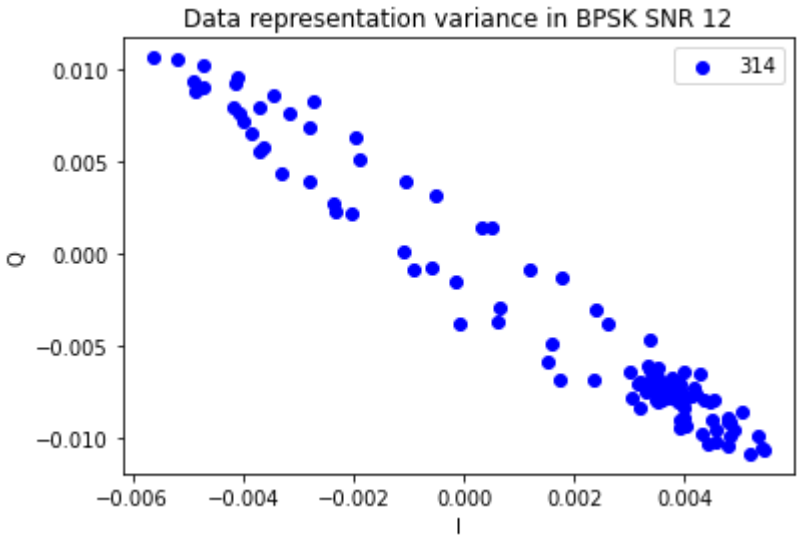

Data representation variance in BPSK SNR 12
309
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

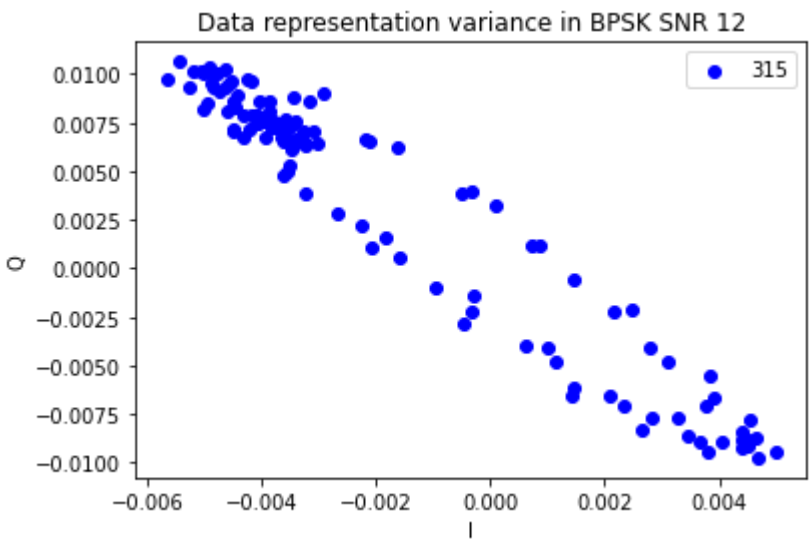

Data representation variance in BPSK SNR 12
310
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

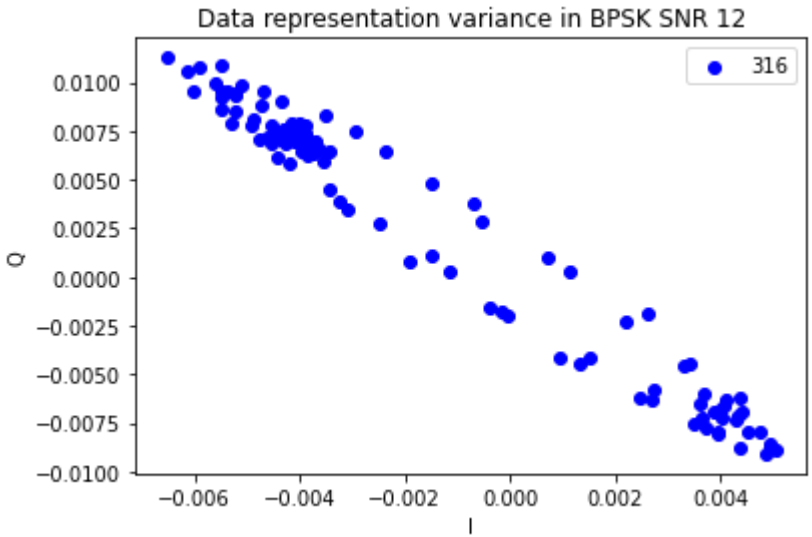

Data representation variance in BPSK SNR 12
311
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

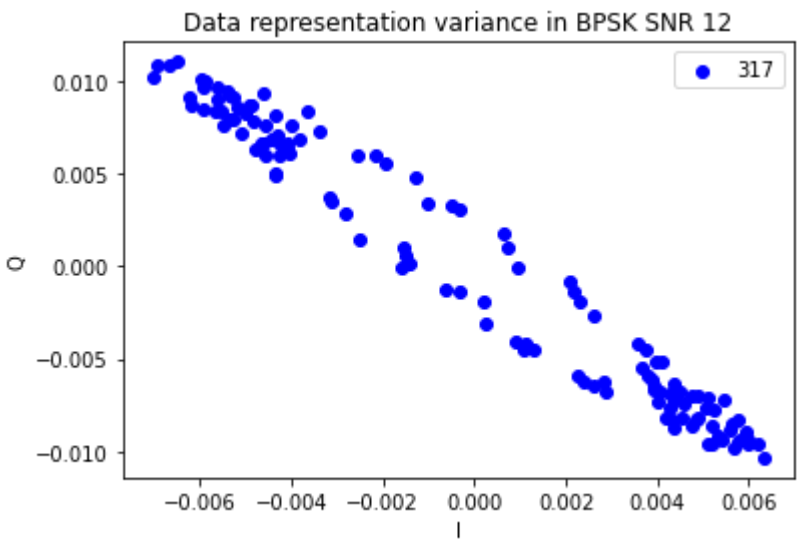

Data representation variance in BPSK SNR 12
312
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

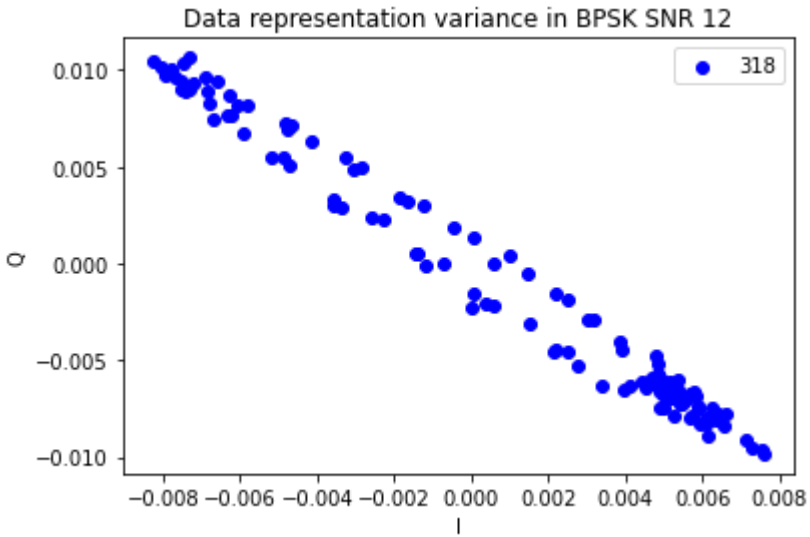

Data representation variance in BPSK SNR 12
313
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

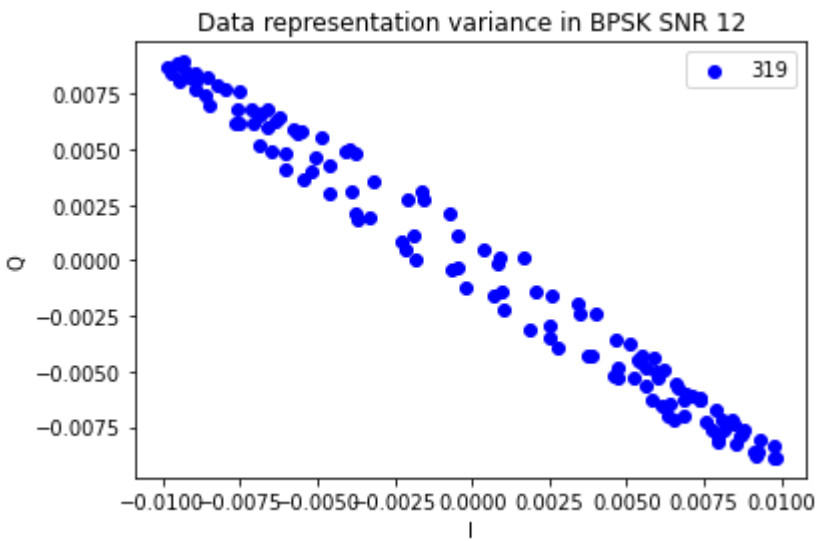

Data representation variance in BPSK SNR 12
314
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
315
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
316
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
317
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
318
0.010
0.005
0.000
−0.005
−0.010
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
319
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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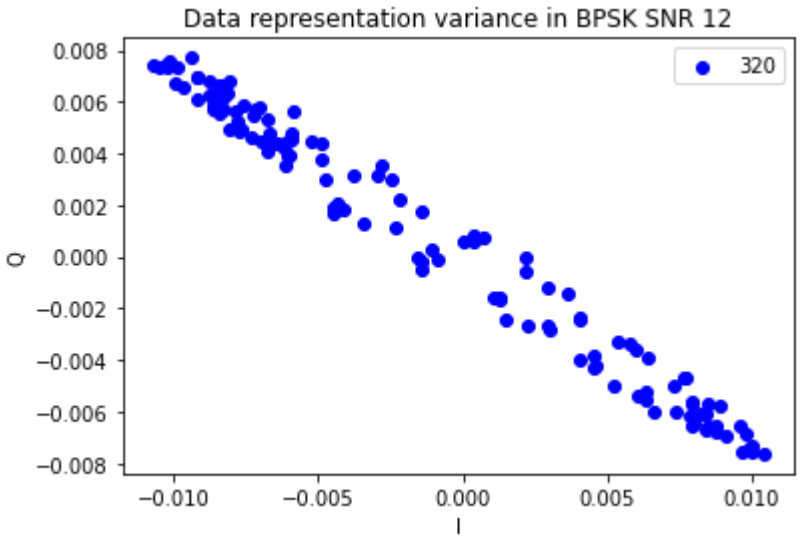
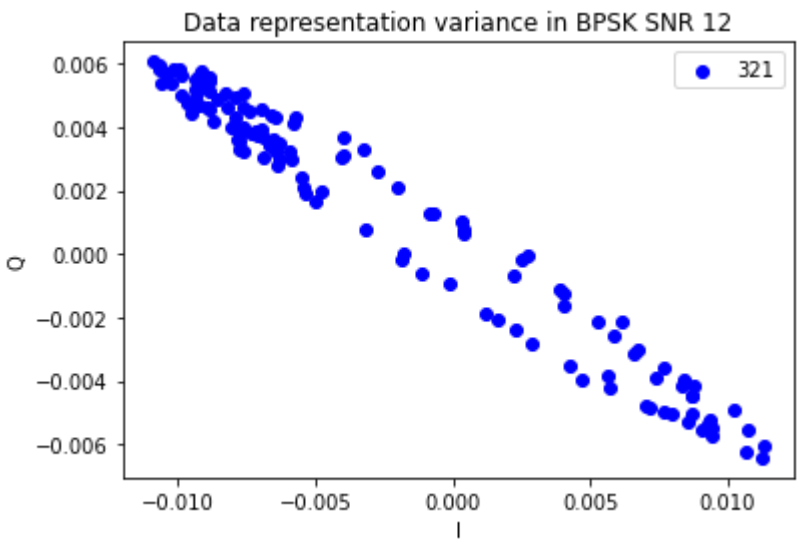
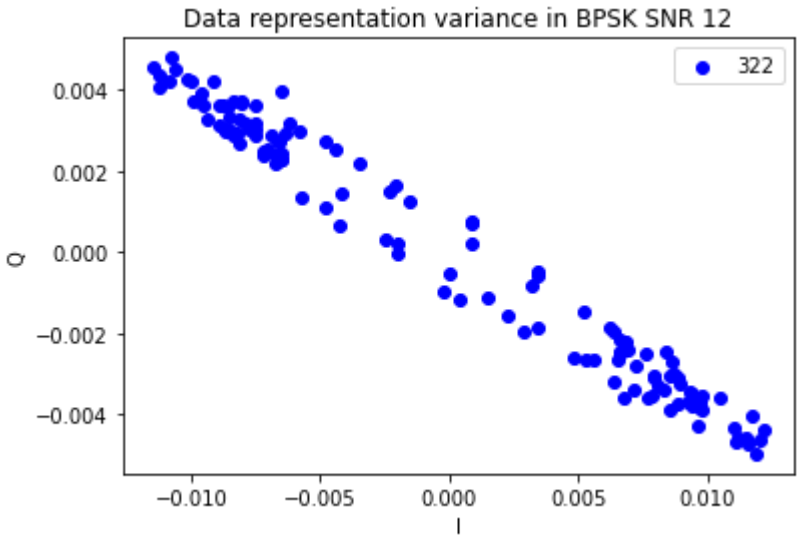
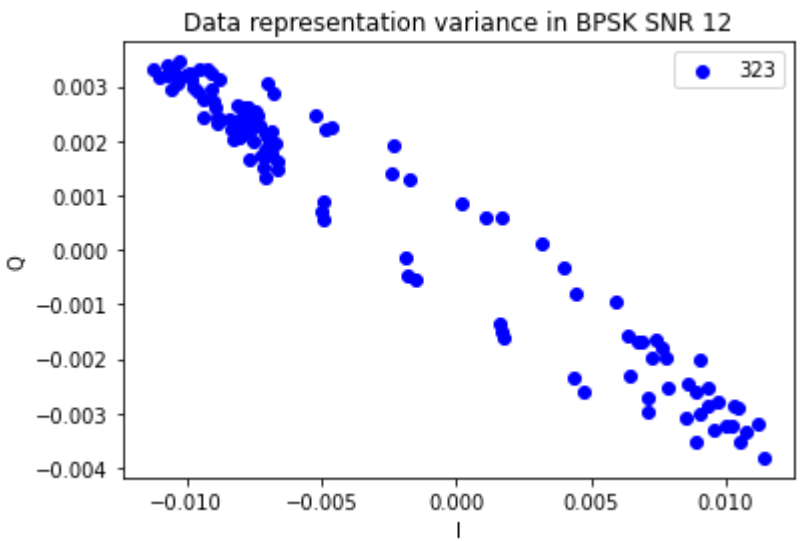
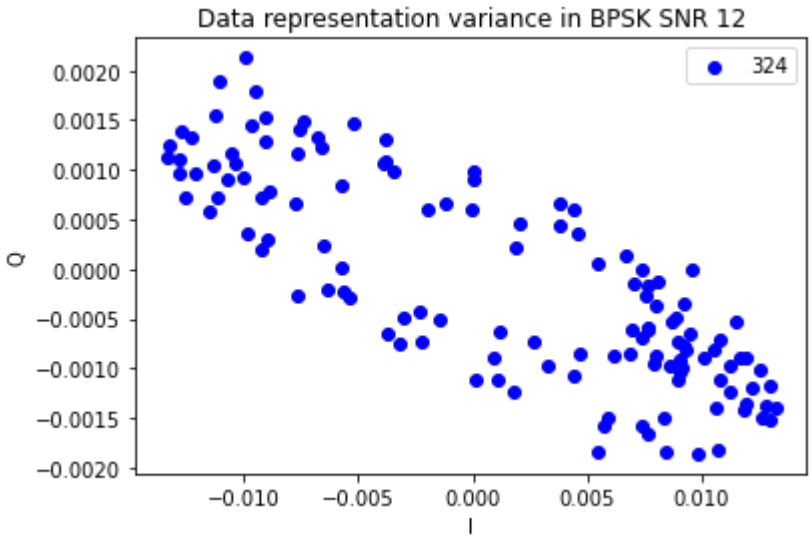
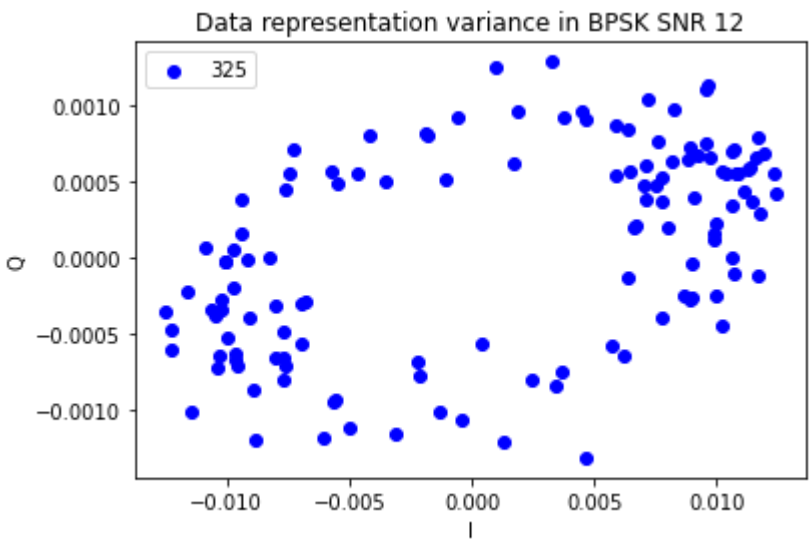

Data representation variance in BPSK SNR 12
320
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
321
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
322
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
323
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
324
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
325
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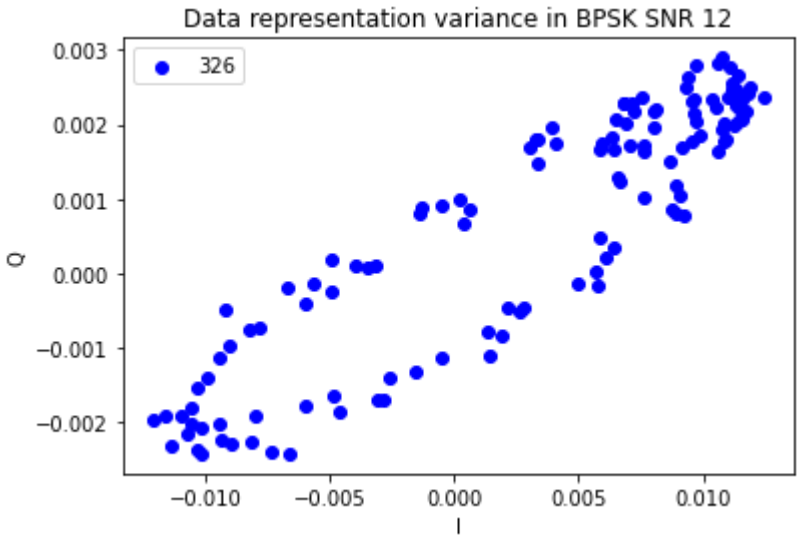
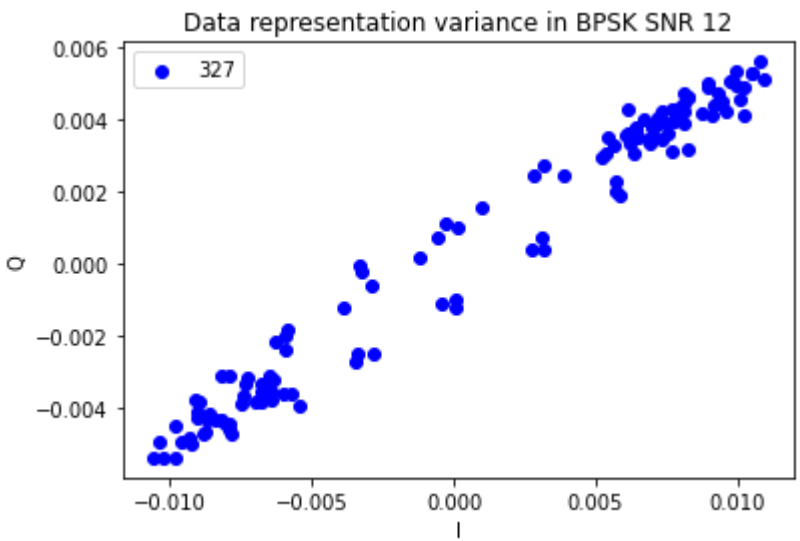
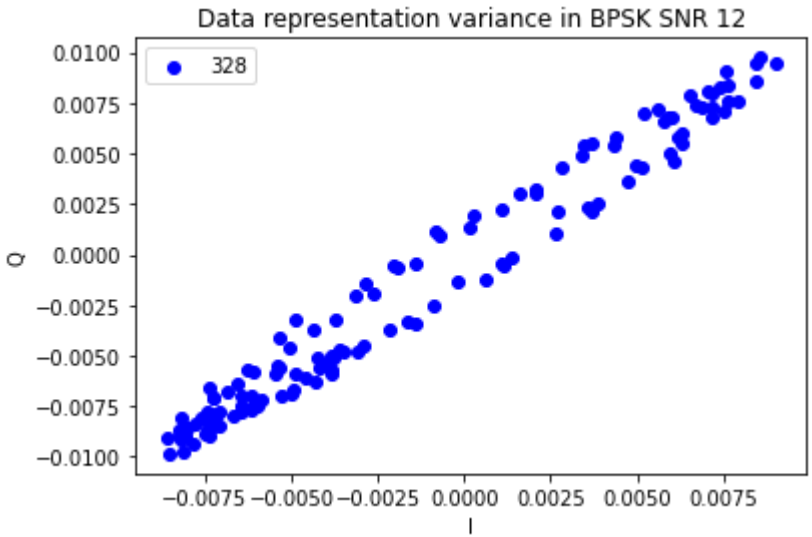
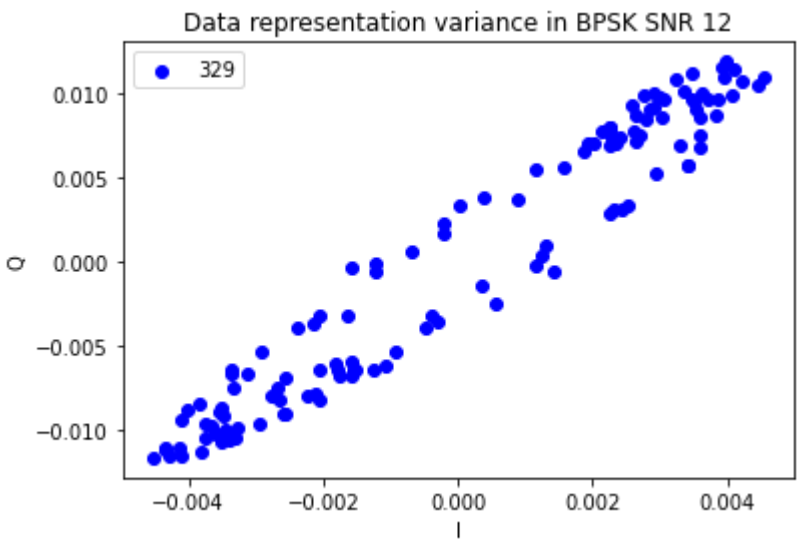
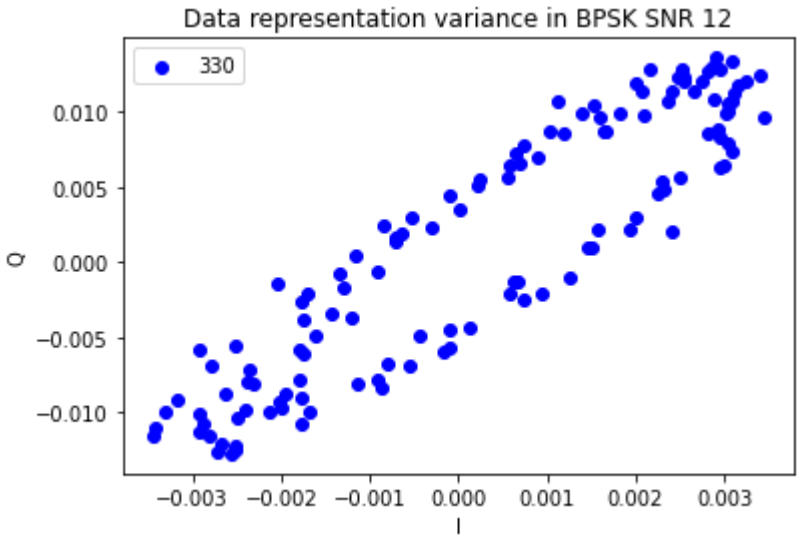
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

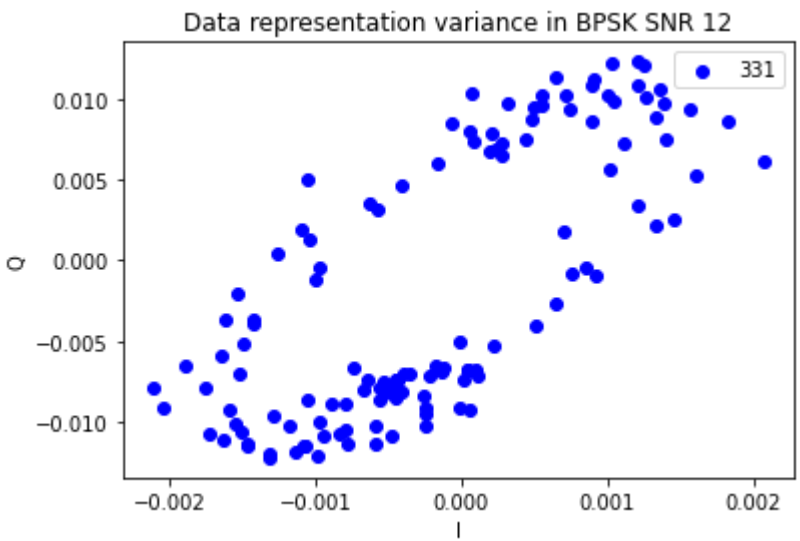

Data representation variance in BPSK SNR 12
326
0.003
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

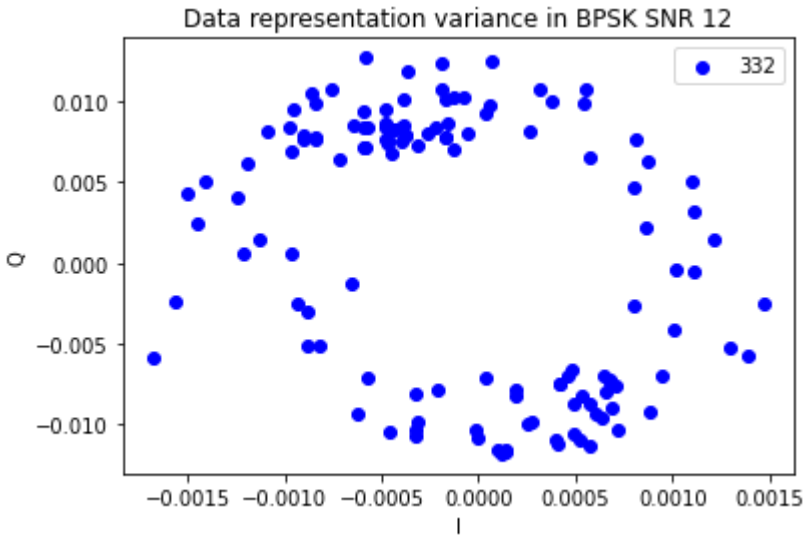

Data representation variance in BPSK SNR 12
327
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

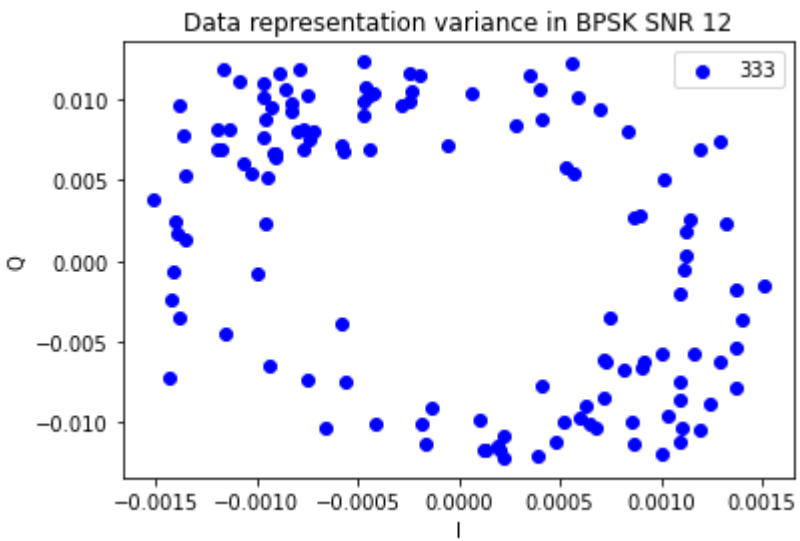

Data representation variance in BPSK SNR 12
328
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

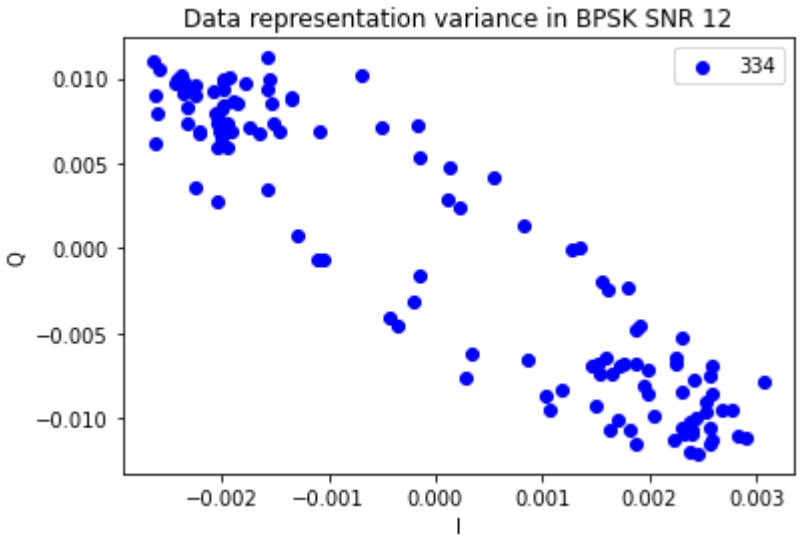

Data representation variance in BPSK SNR 12
329
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

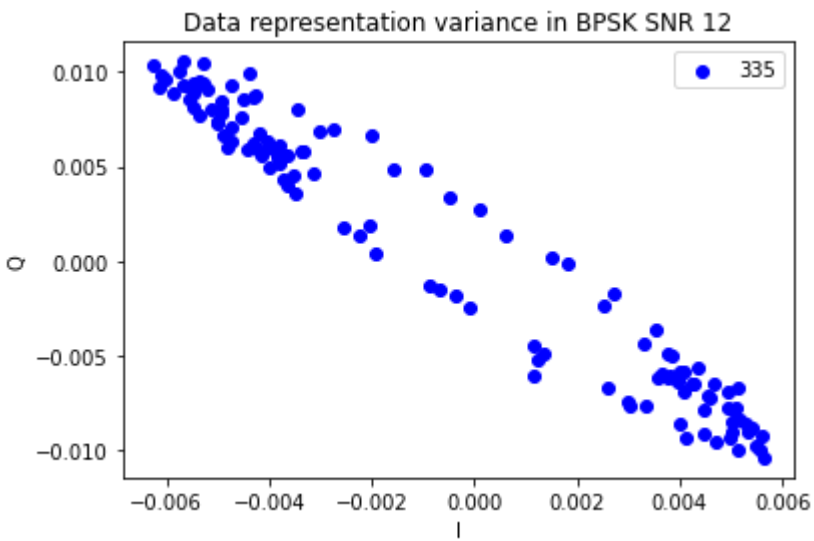

Data representation variance in BPSK SNR 12
330
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

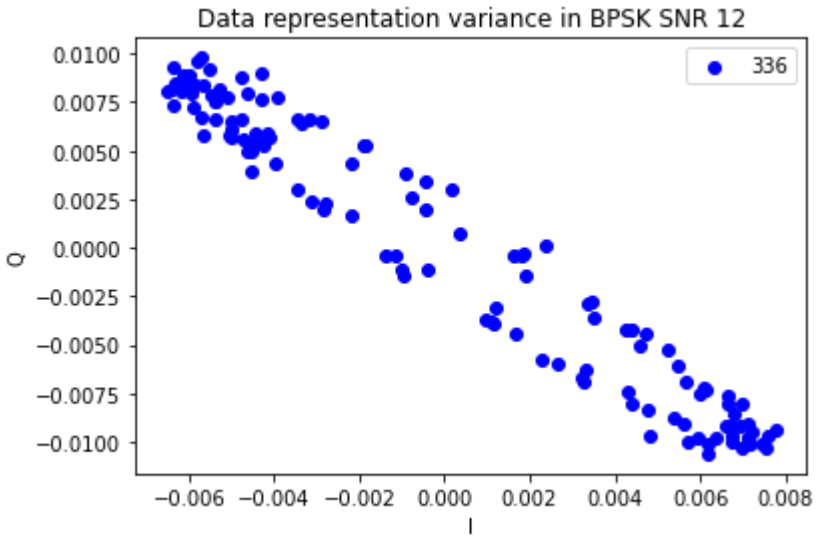

Data representation variance in BPSK SNR 12
331
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

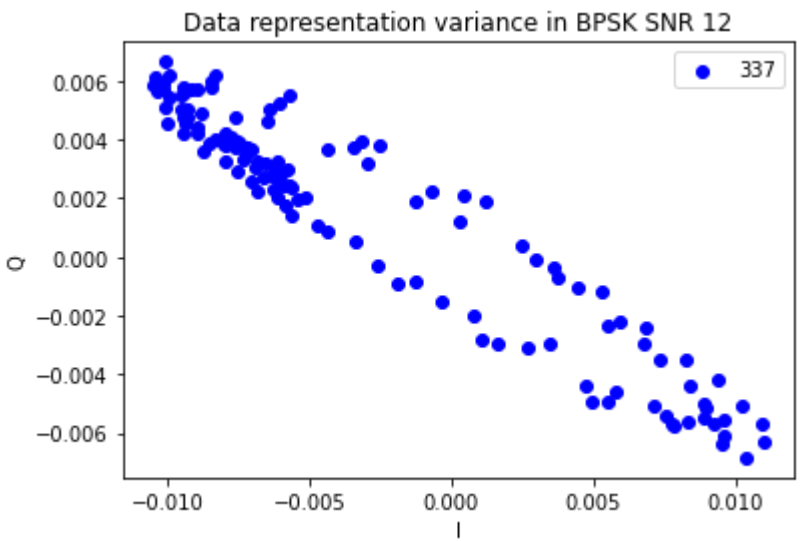

Data representation variance in BPSK SNR 12
332
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I


Data representation variance in BPSK SNR 12
333
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I


Data representation variance in BPSK SNR 12
334
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
335
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
336
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I


Data representation variance in BPSK SNR 12
337
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
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0.005
0.010
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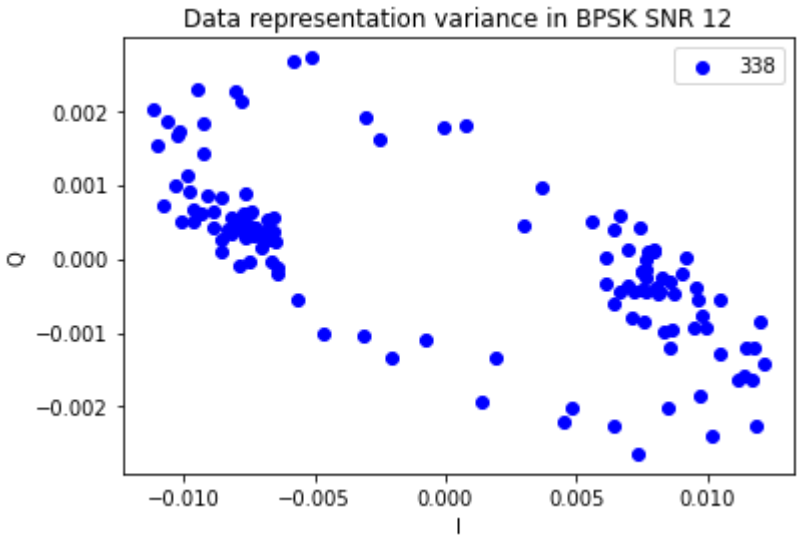
Data representation variance in BPSK SNR 12
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0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
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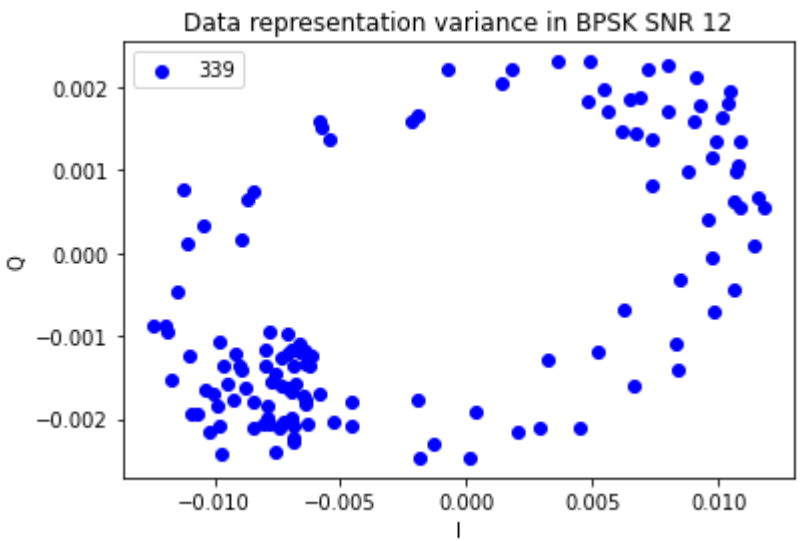
Data representation variance in BPSK SNR 12
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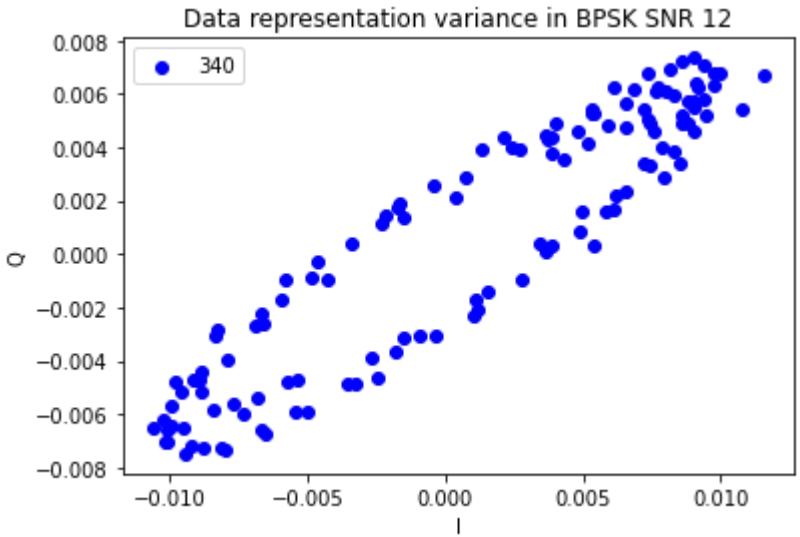
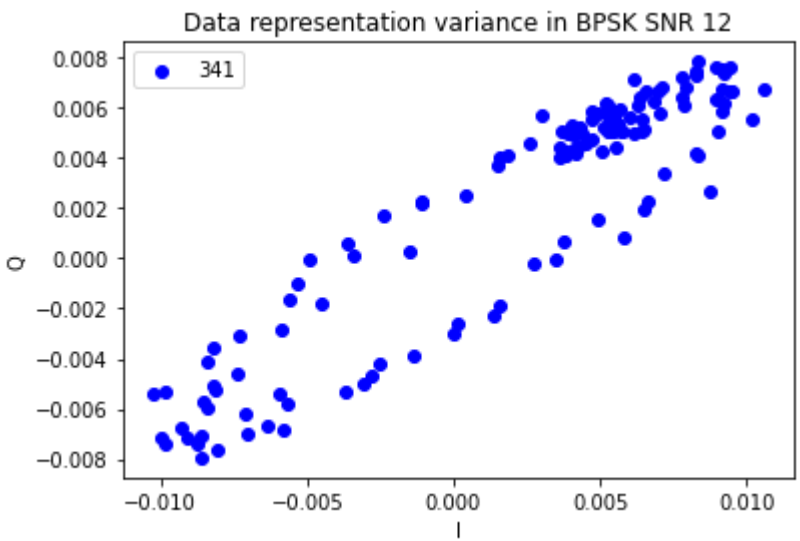
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
340
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
341
0.008
0.006
0.004
0.002
0.000
−0.002
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−0.006
−0.008
Q
−0.010
−0.005
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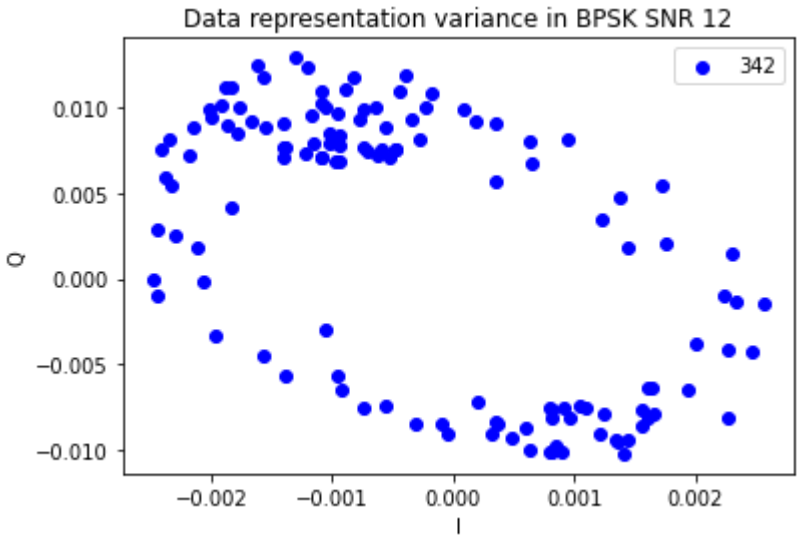
Data representation variance in BPSK SNR 12
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−0.005
−0.010
Q
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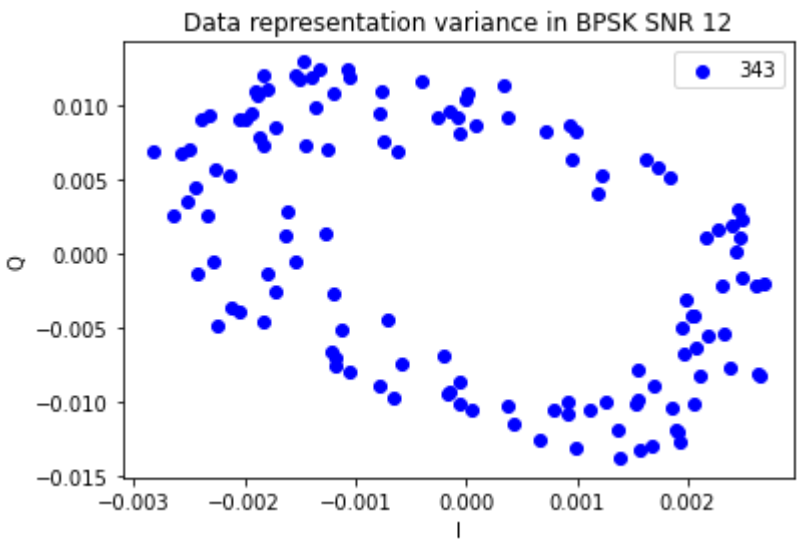
Data representation variance in BPSK SNR 12
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0.010
0.005
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−0.015
Q
−0.003
−0.002
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0.001
0.002
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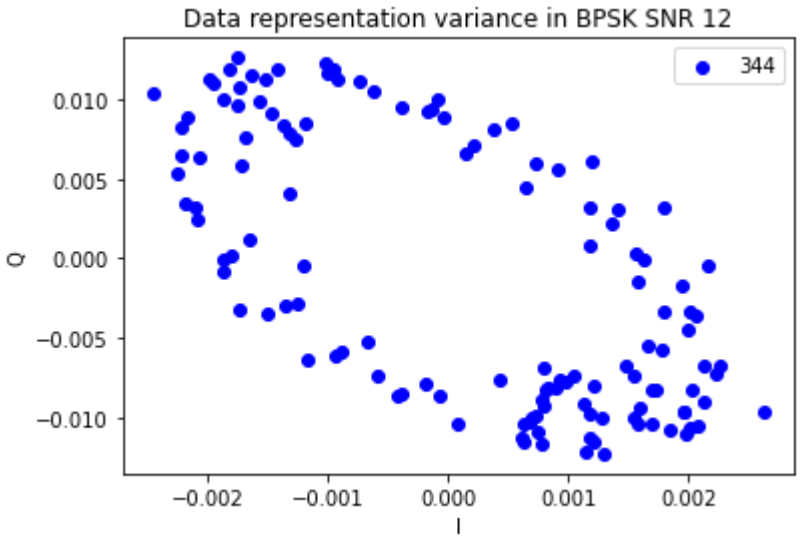
Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
Q
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−0.001
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0.002
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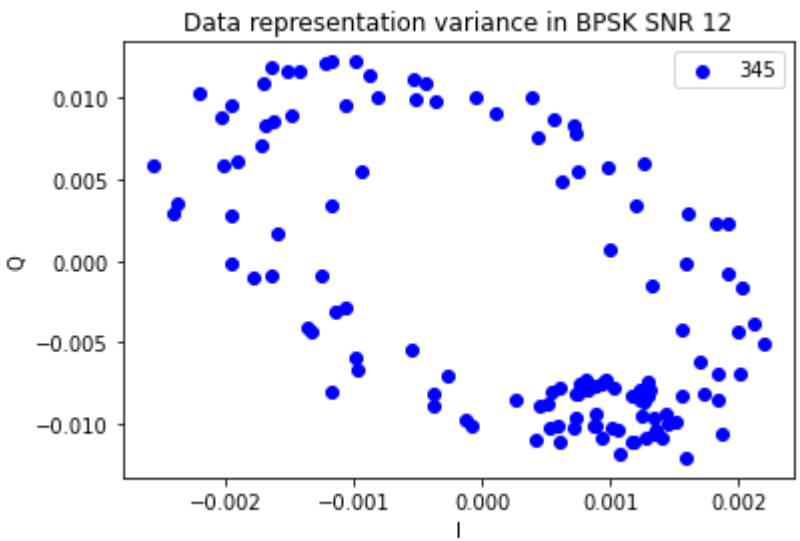
Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
Q
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−0.001
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0.001
0.002
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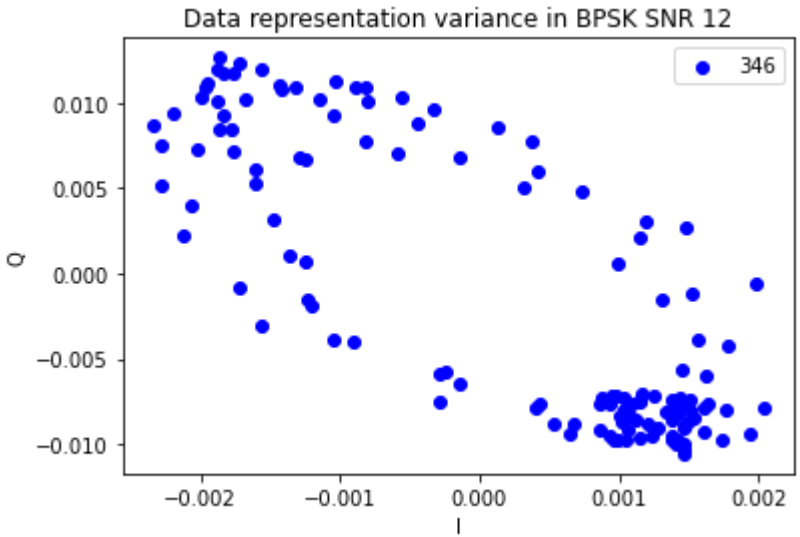
Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
Q
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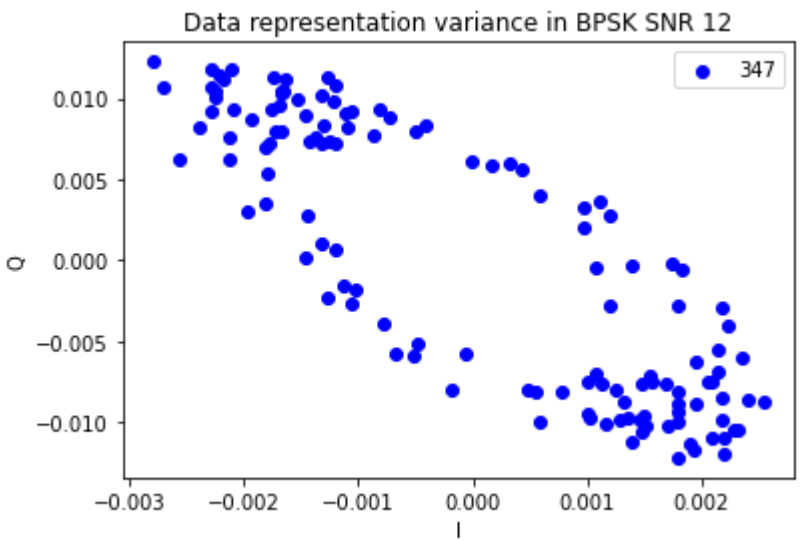
0.001
0.002
I


Data representation variance in BPSK SNR 12
347
0.010
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0.000
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−0.010
Q
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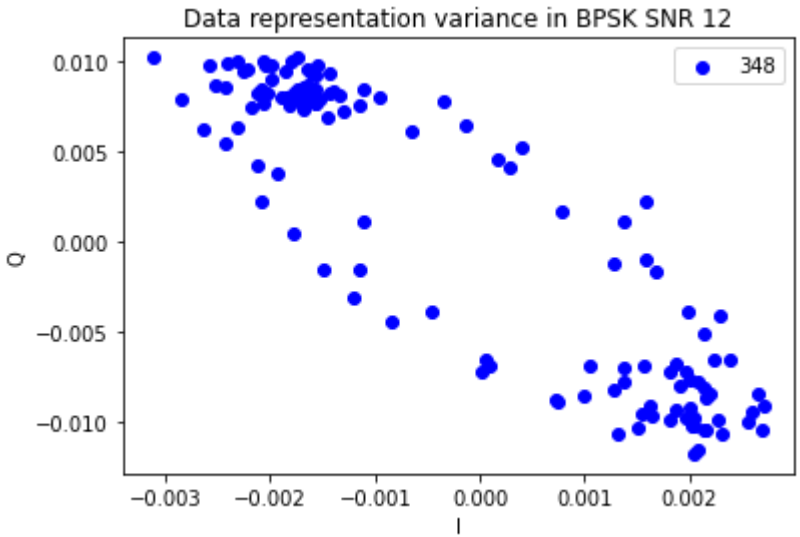
Data representation variance in BPSK SNR 12
348
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0.000
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−0.010
Q
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−0.001
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0.001
0.002
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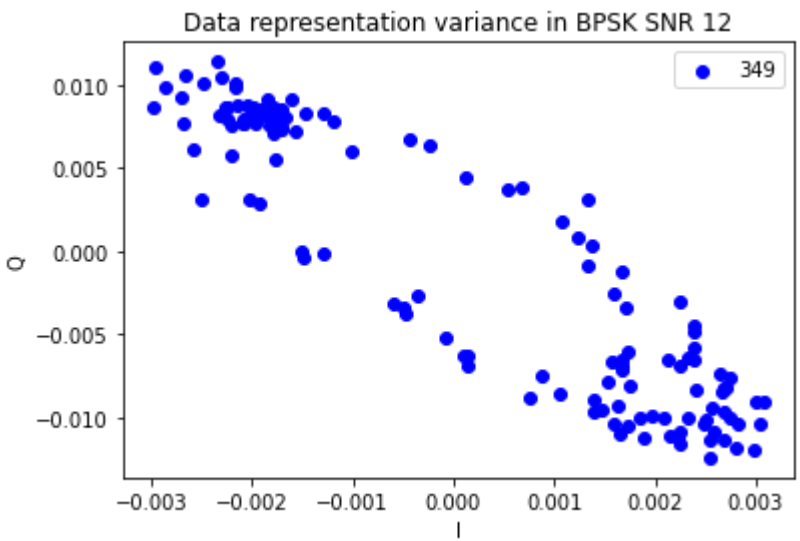
Data representation variance in BPSK SNR 12
349
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.001
0.000
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0.002
0.003
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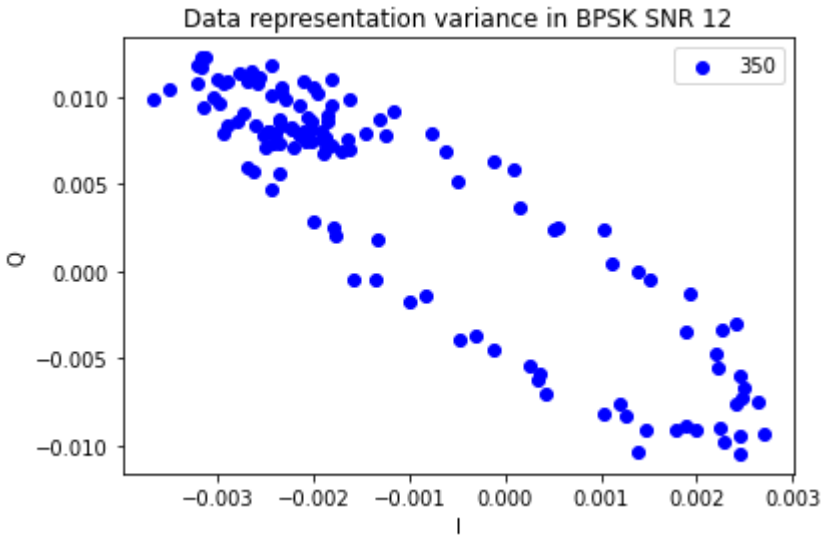
Data representation variance in BPSK SNR 12
350
0.010
0.005
0.000
−0.005
−0.010
Q
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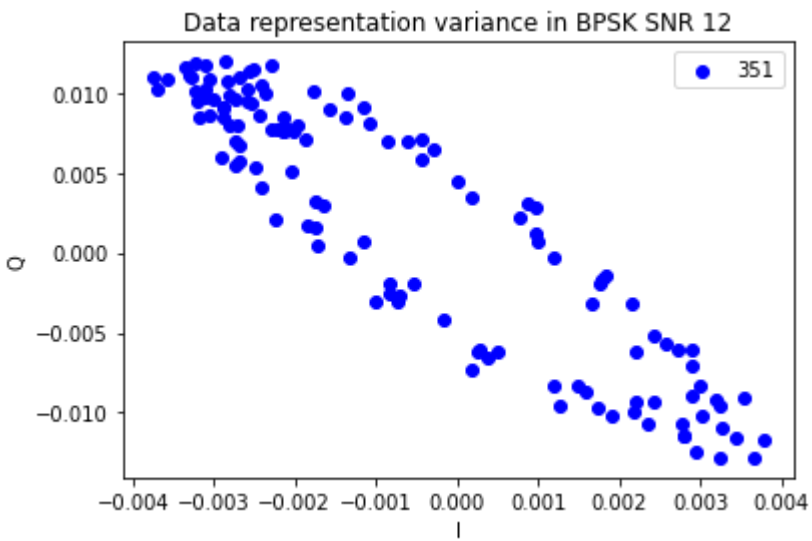
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
351
0.010
0.005
0.000
−0.005
−0.010
Q
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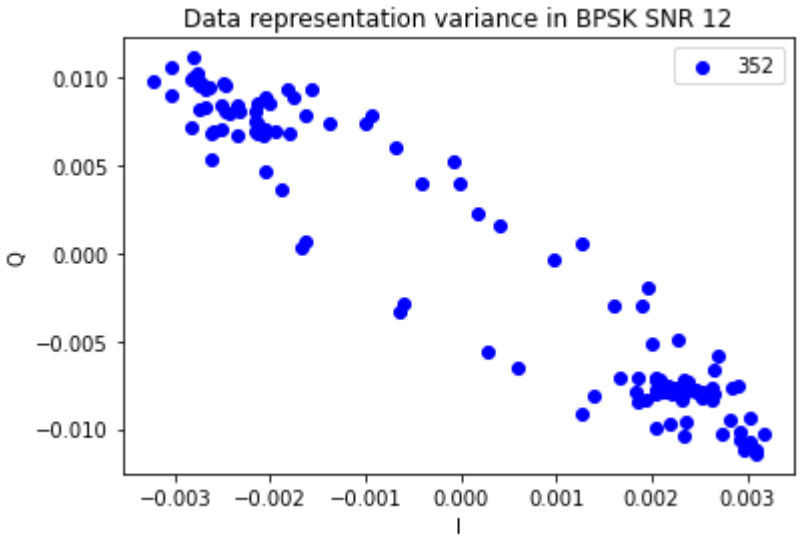
Data representation variance in BPSK SNR 12
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0.010
0.005
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−0.005
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Q
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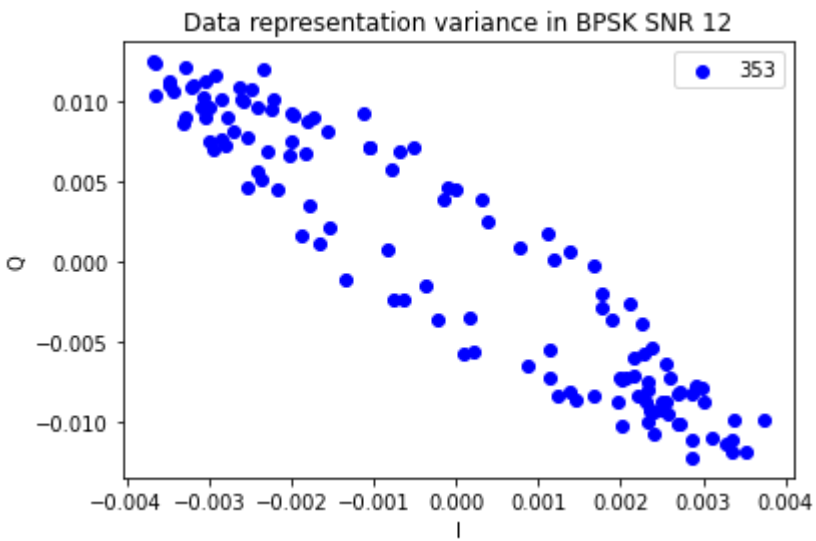
Data representation variance in BPSK SNR 12
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0.010
0.005
0.000
−0.005
−0.010
Q
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−0.001
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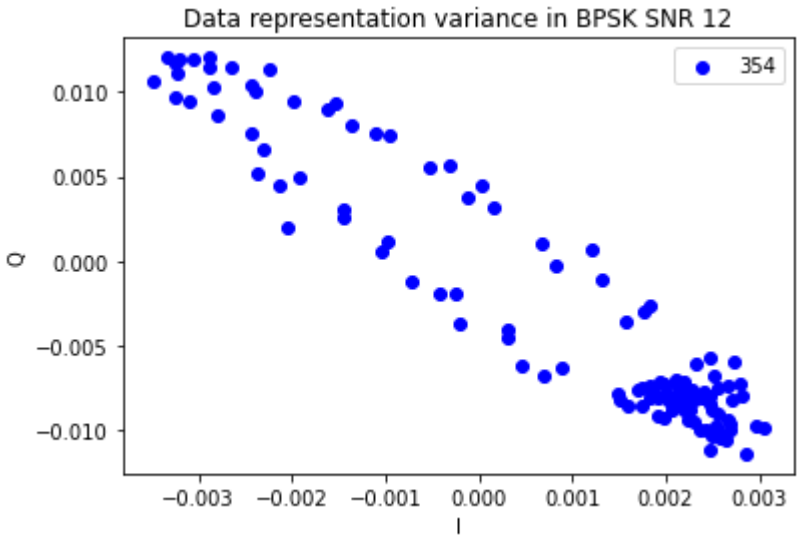
Data representation variance in BPSK SNR 12
354
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
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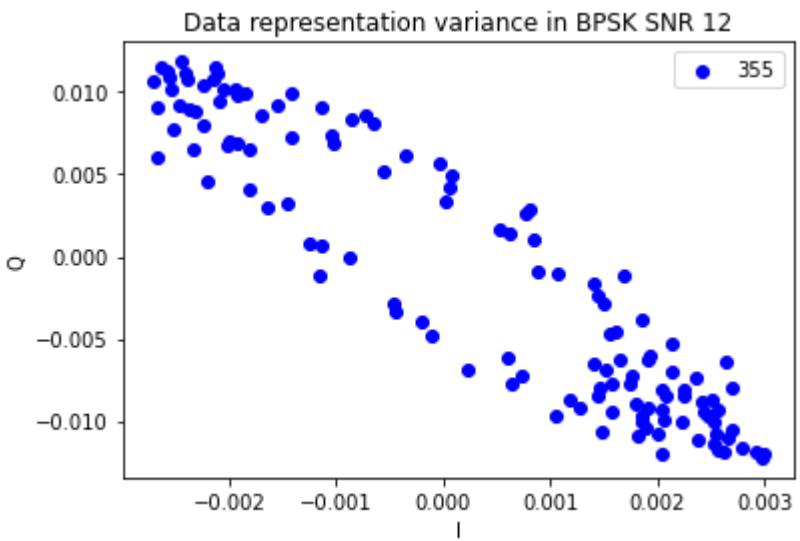
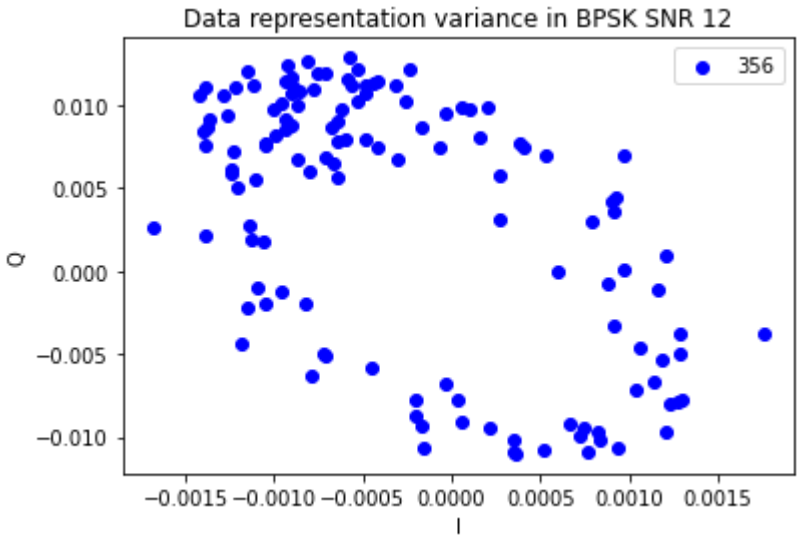

Data representation variance in BPSK SNR 12
355
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
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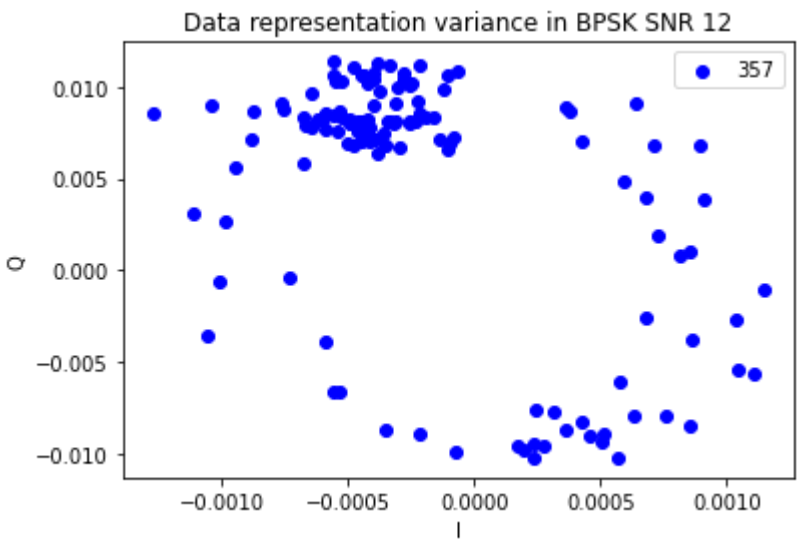
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I


Data representation variance in BPSK SNR 12
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0.005
0.000
−0.005
−0.010
Q
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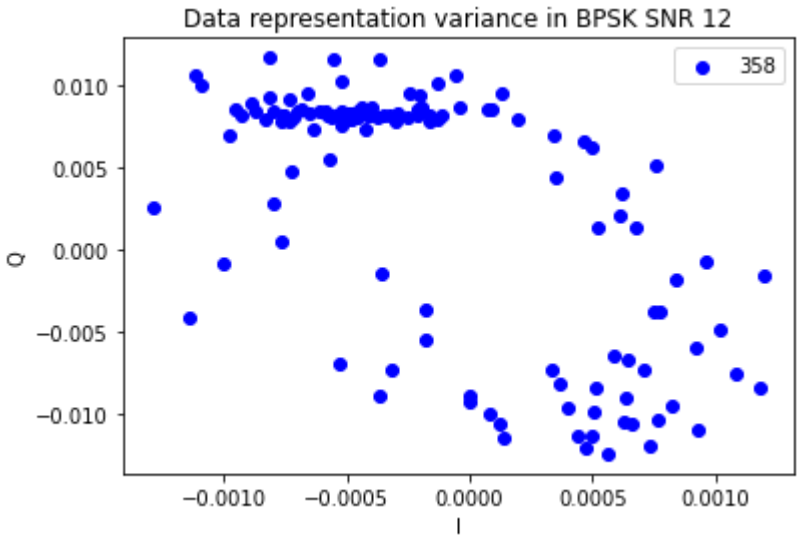
Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
Q
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−0.0005
0.0000
0.0005
0.0010
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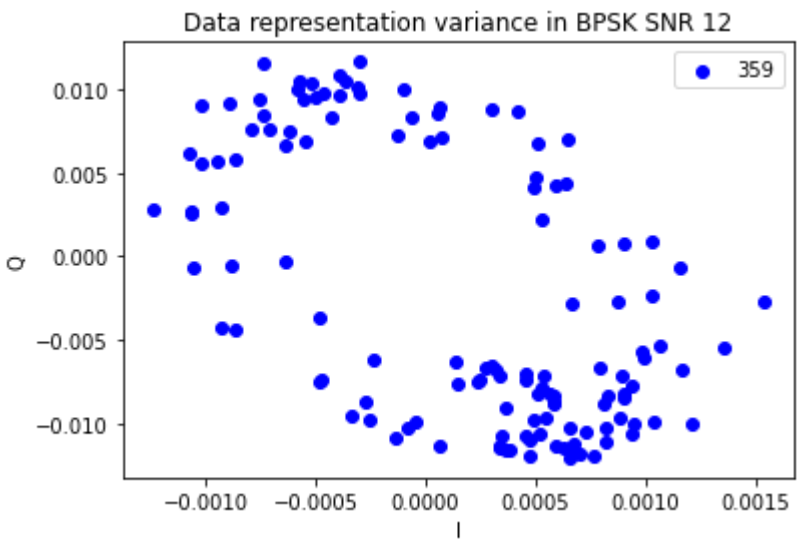
Data representation variance in BPSK SNR 12
359
0.010
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0.000
−0.005
−0.010
Q
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−0.0005
0.0000
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0.0015
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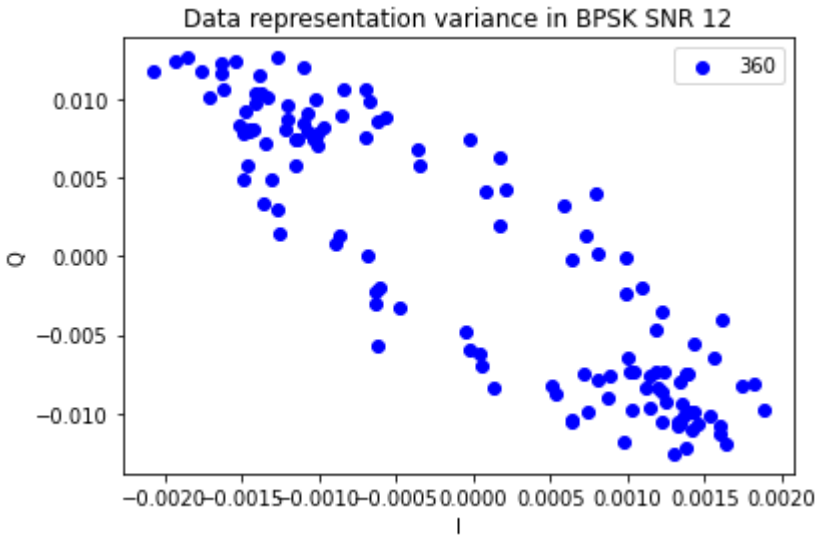
Data representation variance in BPSK SNR 12
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0.000
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−0.010
Q
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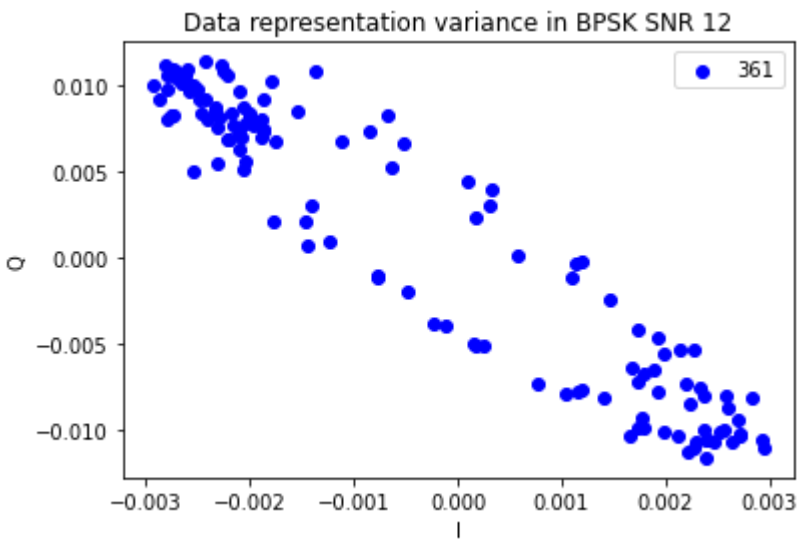
Data representation variance in BPSK SNR 12
361
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0.000
−0.005
−0.010
Q
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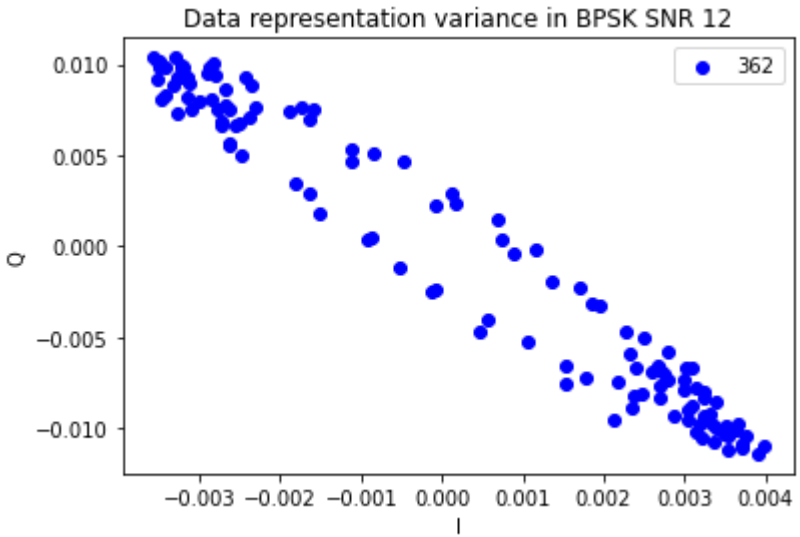
Data representation variance in BPSK SNR 12
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−0.005
−0.010
Q
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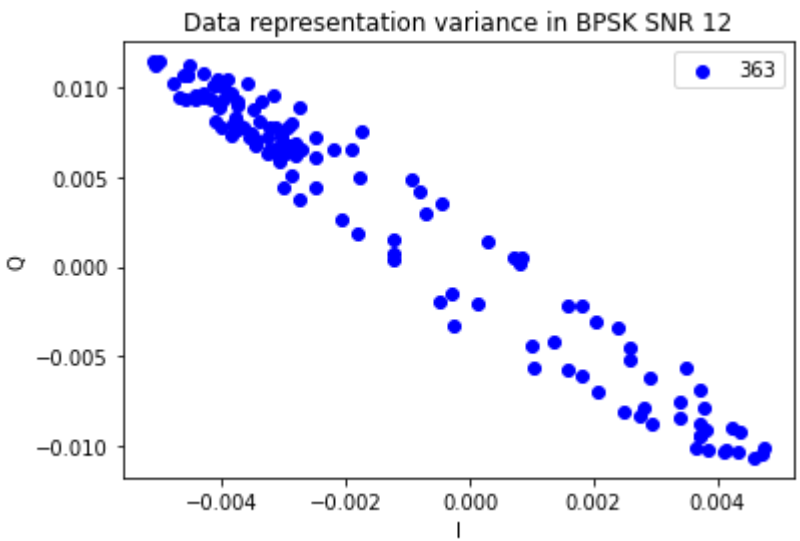
Data representation variance in BPSK SNR 12
363
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0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
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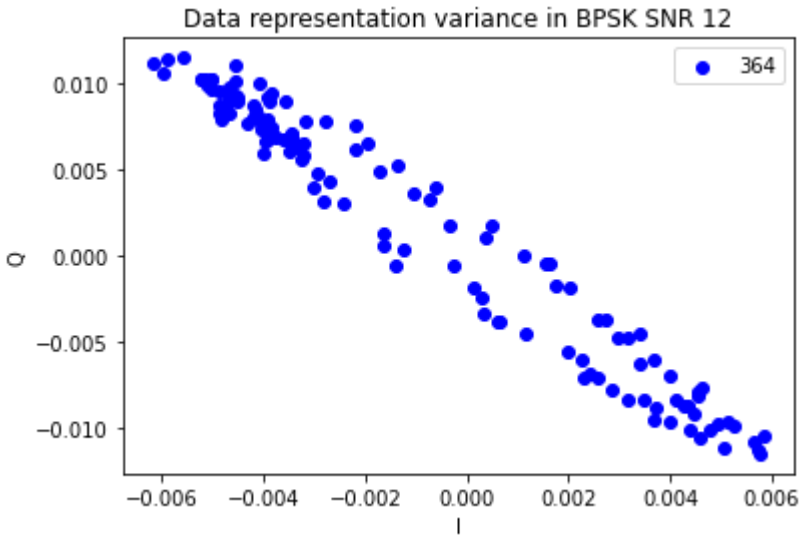
Data representation variance in BPSK SNR 12
364
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
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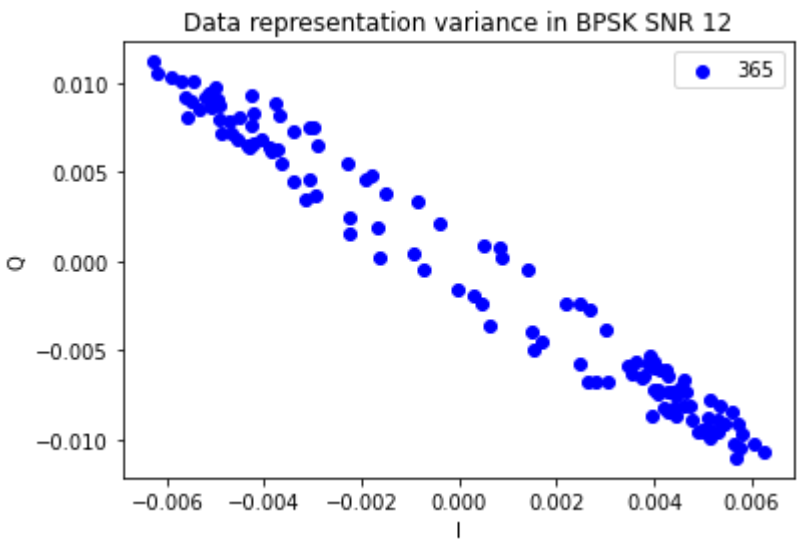
0.004
0.006
I


Data representation variance in BPSK SNR 12
365
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.004
−0.002
0.000
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0.004
0.006
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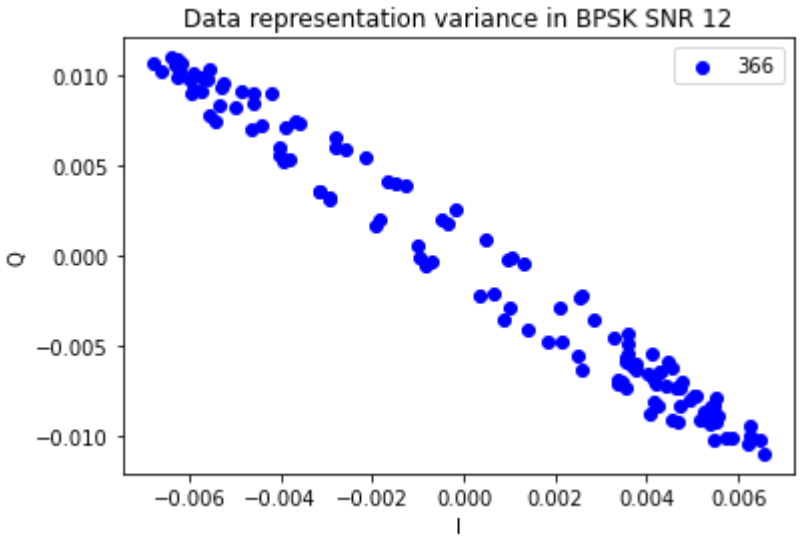
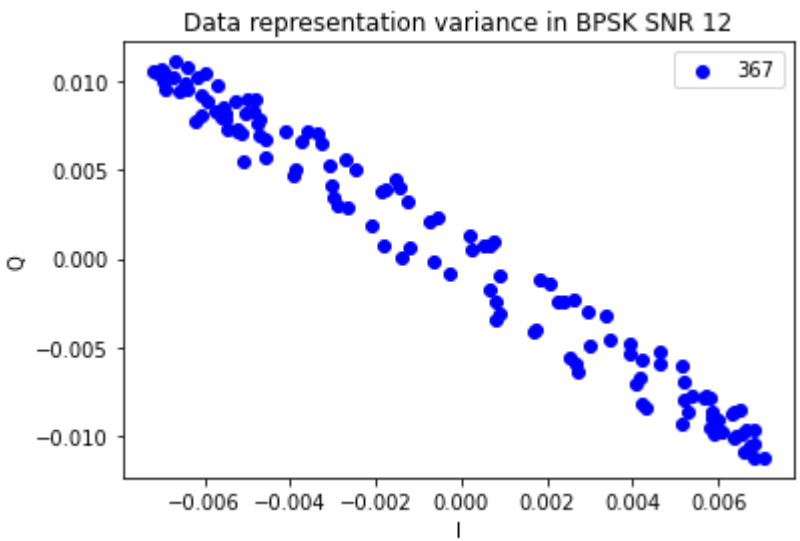
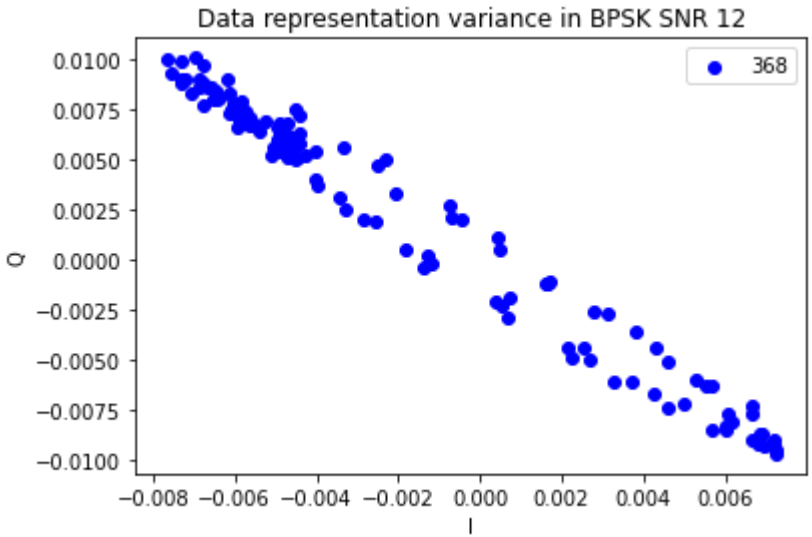

Data representation variance in BPSK SNR 12
366
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
367
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
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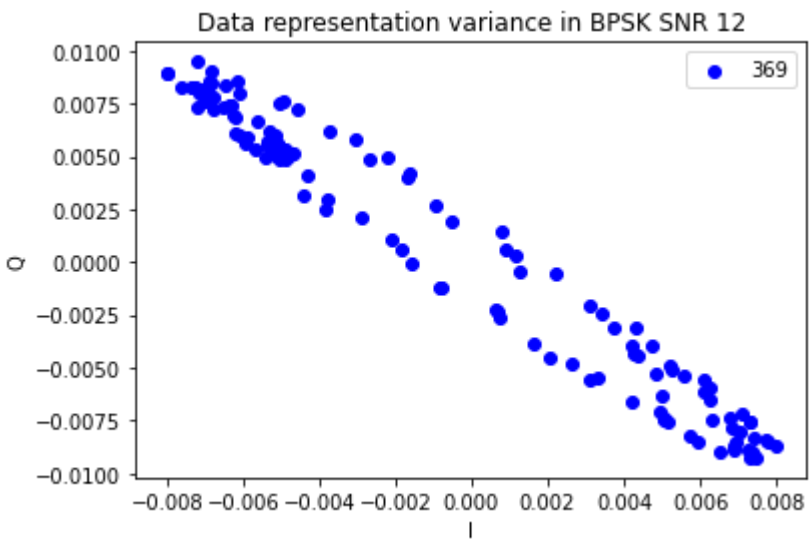
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
369
0.0100
0.0075
0.0050
0.0025
0.0000
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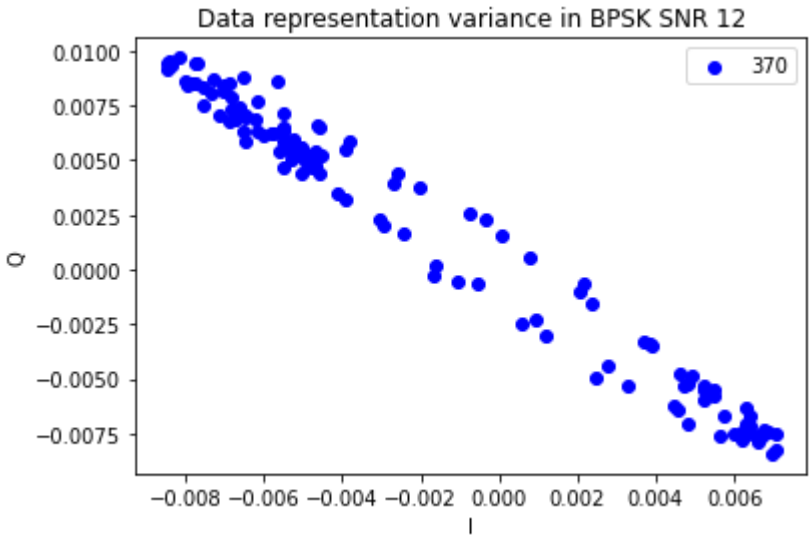
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
370
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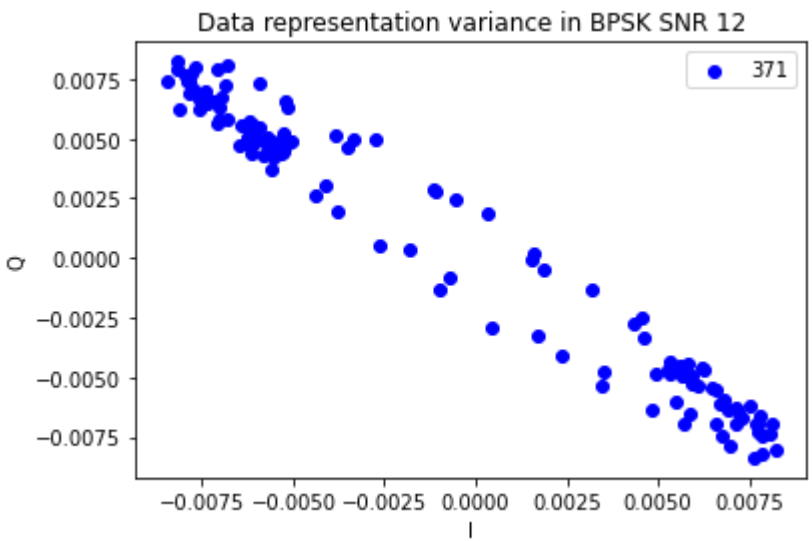
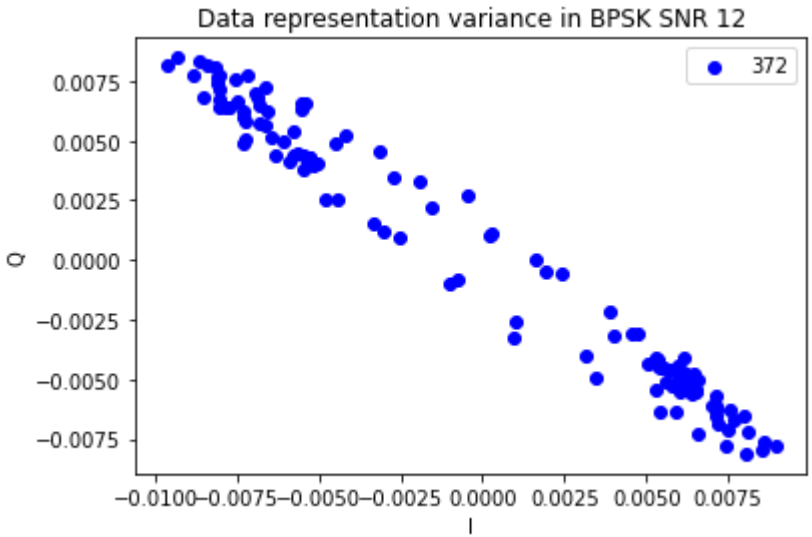
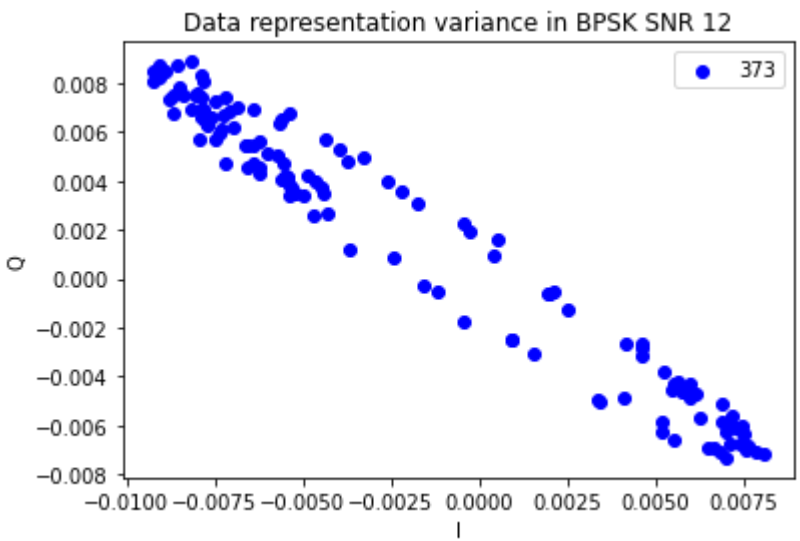
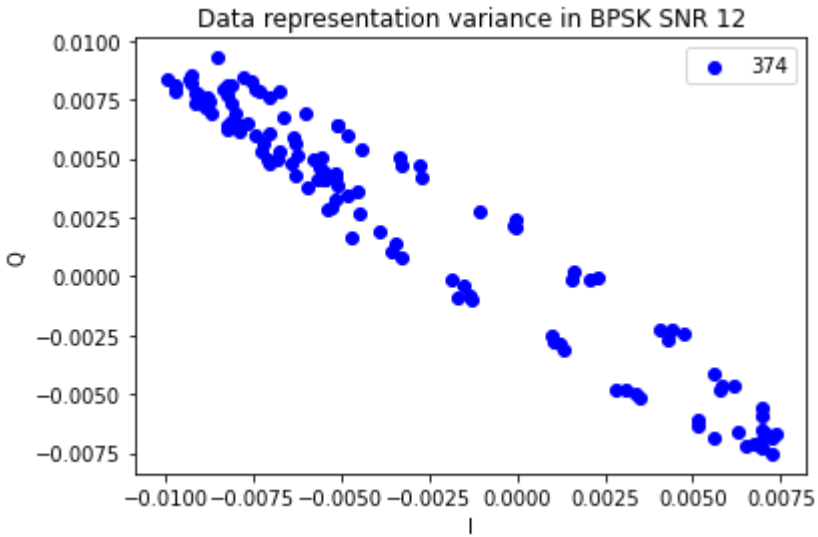
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
371
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
372
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
373
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
374
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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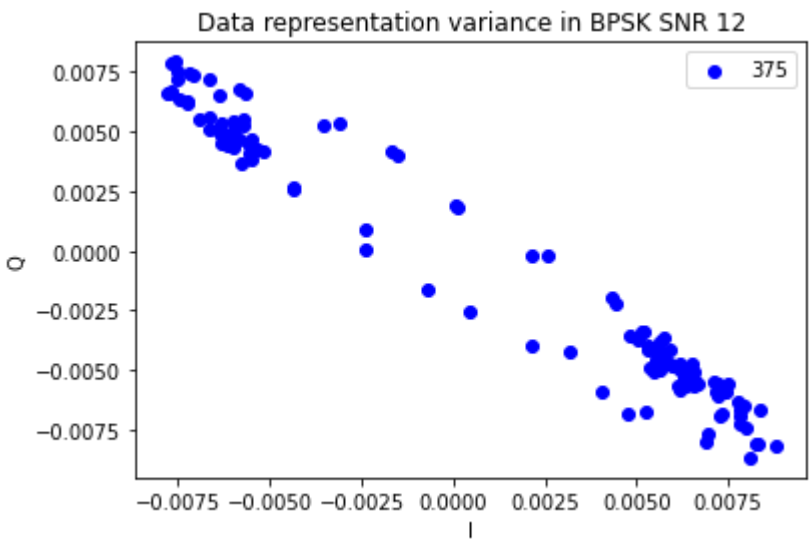
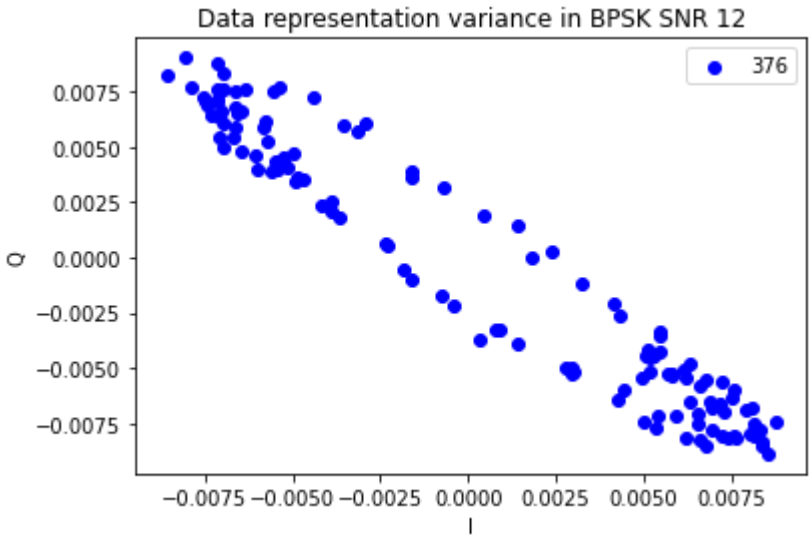
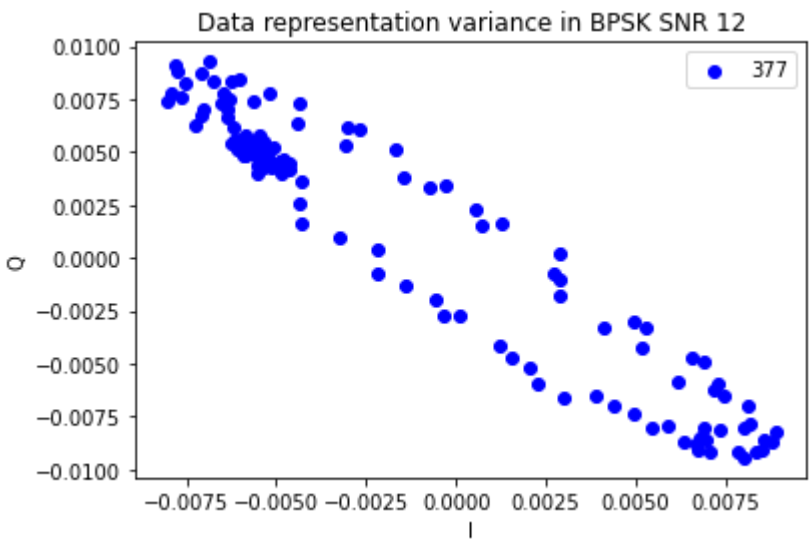

Data representation variance in BPSK SNR 12
375
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
376
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
377
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
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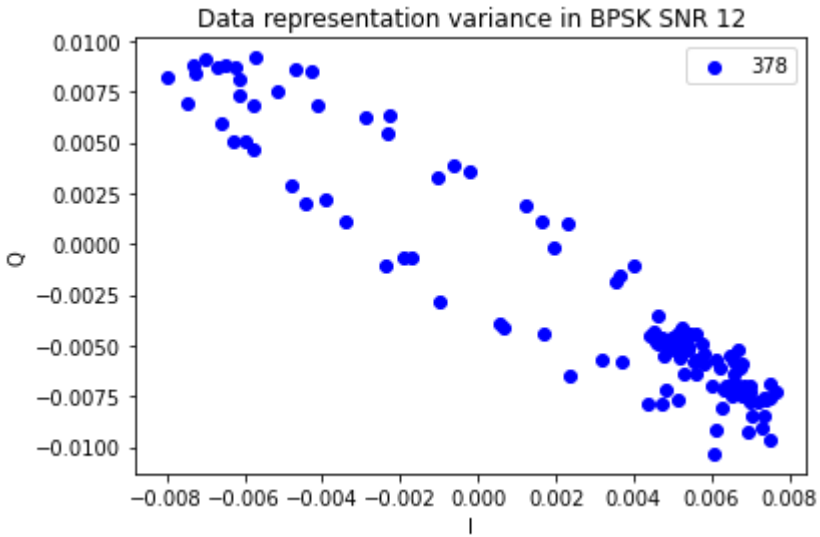
Data representation variance in BPSK SNR 12
378
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
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−0.0100
Q
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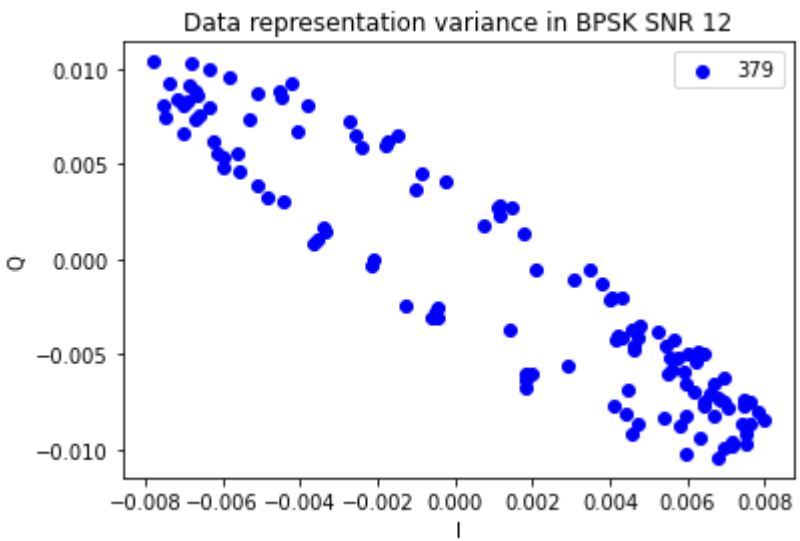
Data representation variance in BPSK SNR 12
379
0.010
0.005
0.000
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−0.010
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
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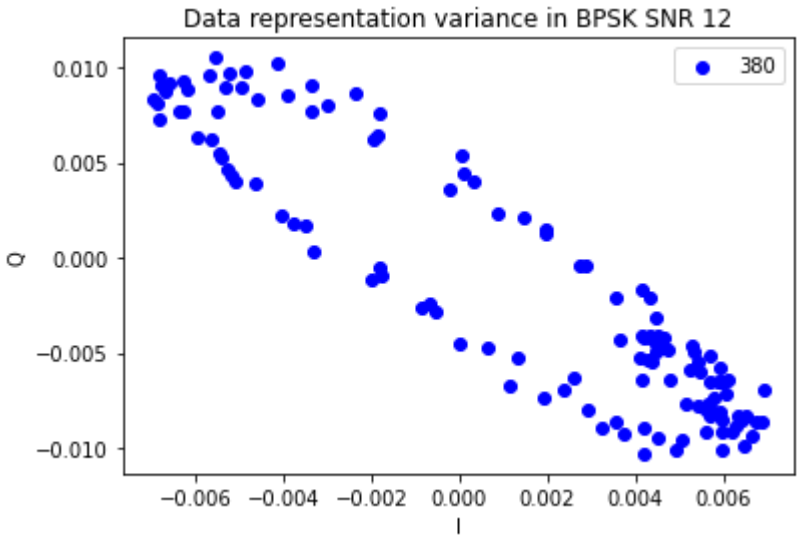
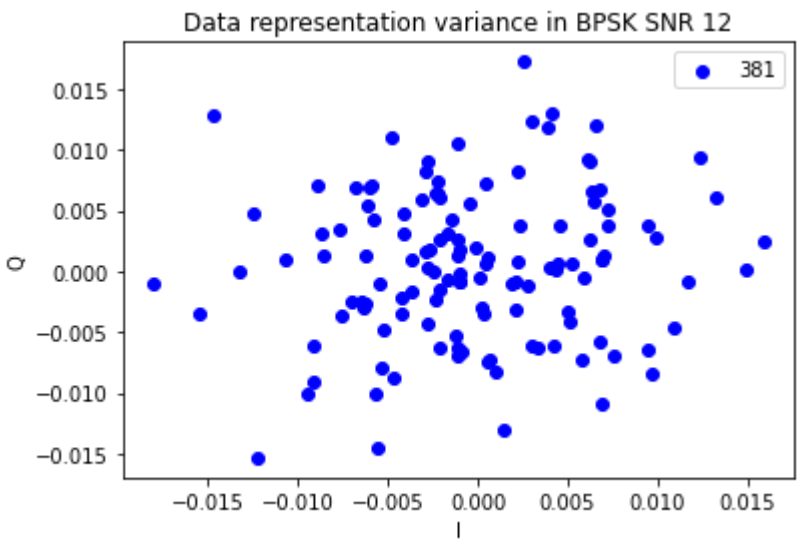

Data representation variance in BPSK SNR 12
380
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
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0.005
0.000
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Q
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−0.010
−0.005
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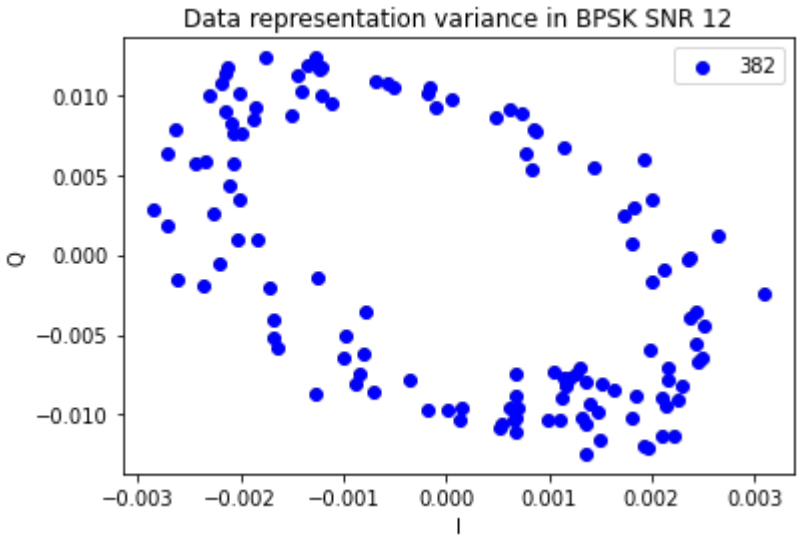
0.015
I


Data representation variance in BPSK SNR 12
382
0.010
0.005
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−0.005
−0.010
Q
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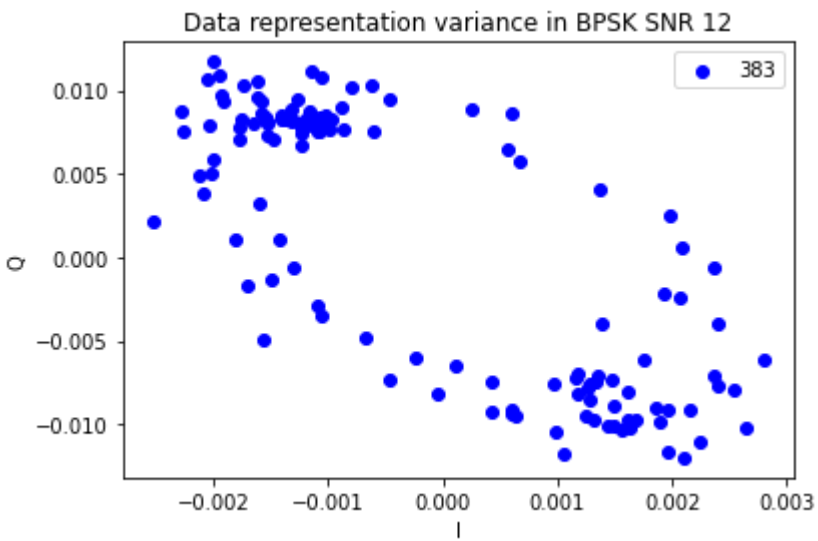
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
383
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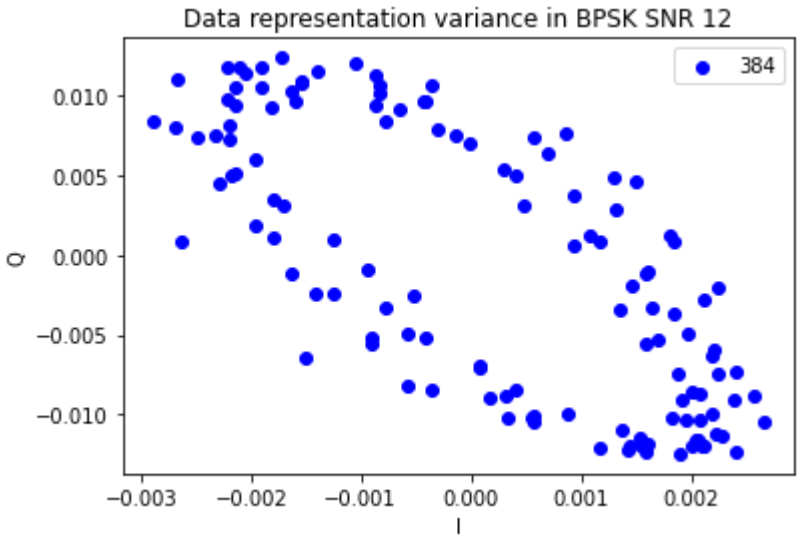
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
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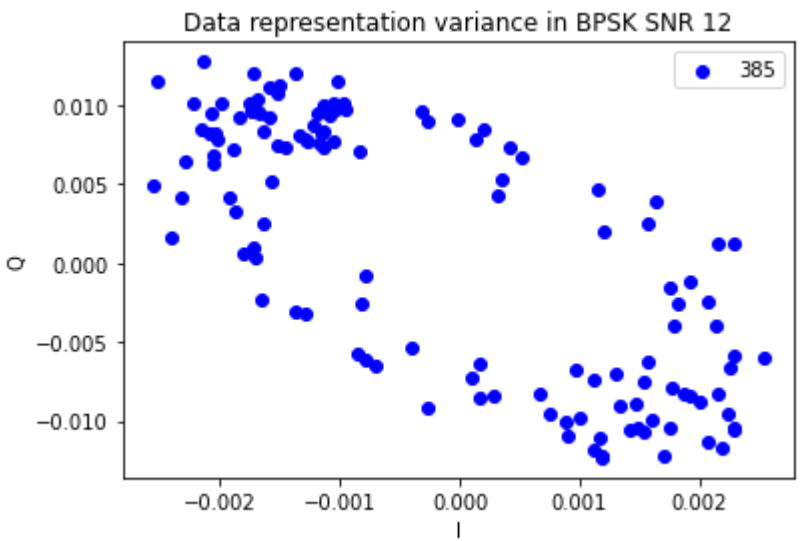
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
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−0.005
−0.010
Q
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−0.001
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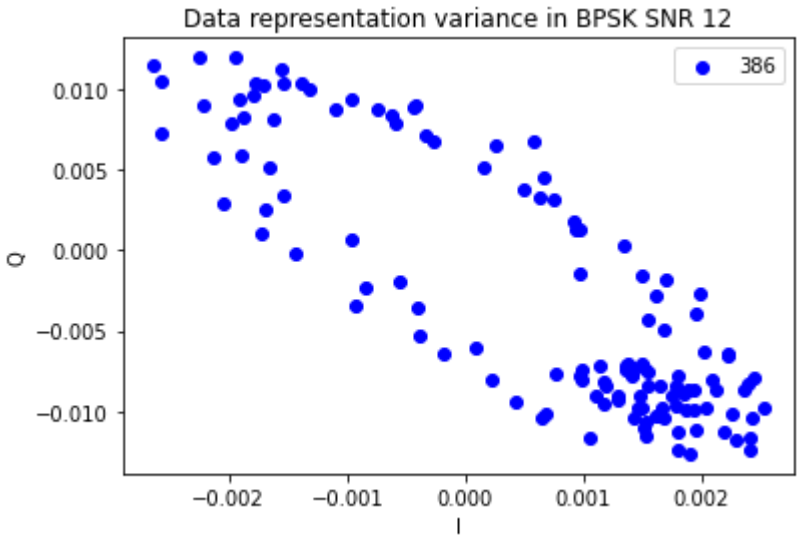
0.001
0.002
I


Data representation variance in BPSK SNR 12
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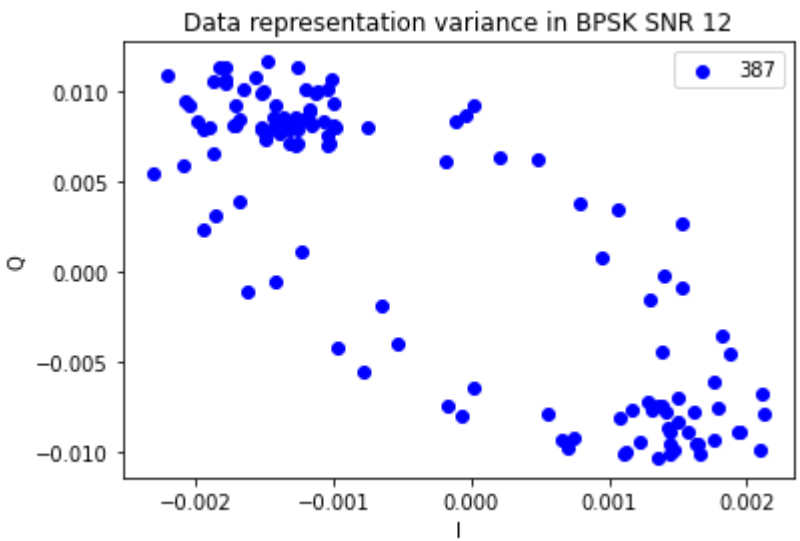
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
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0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
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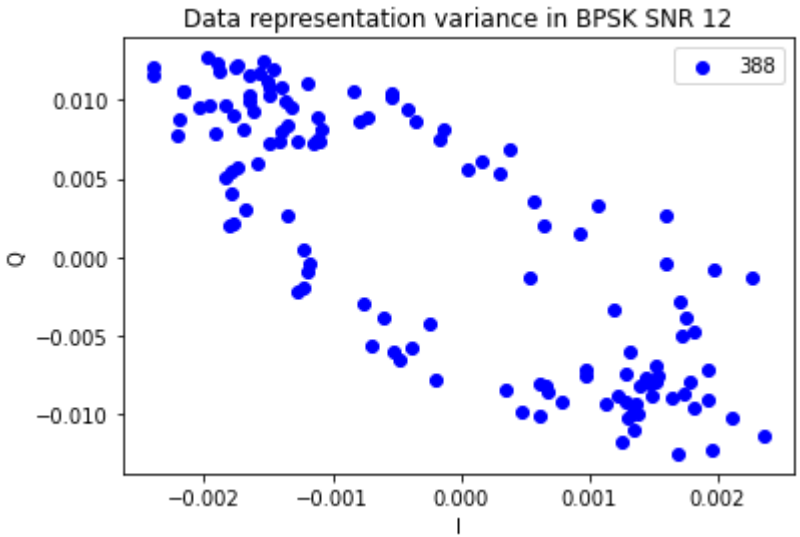
0.001
0.002
I


Data representation variance in BPSK SNR 12
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0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
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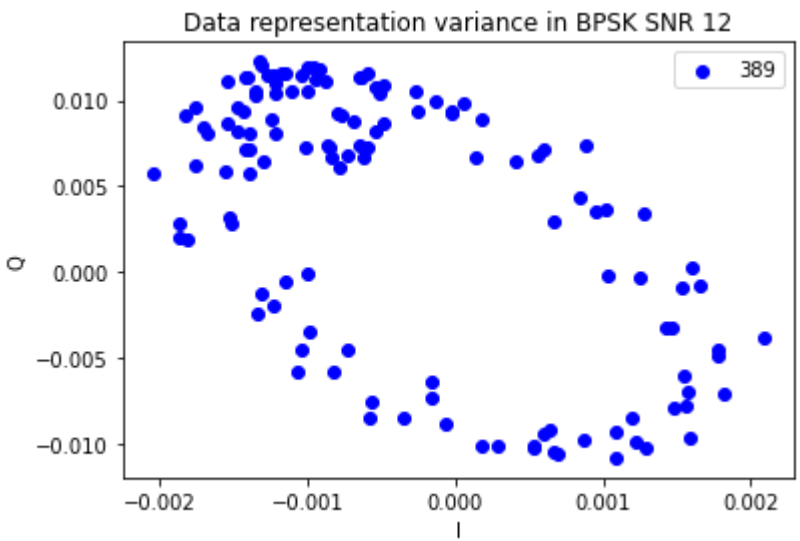
0.002
I


Data representation variance in BPSK SNR 12
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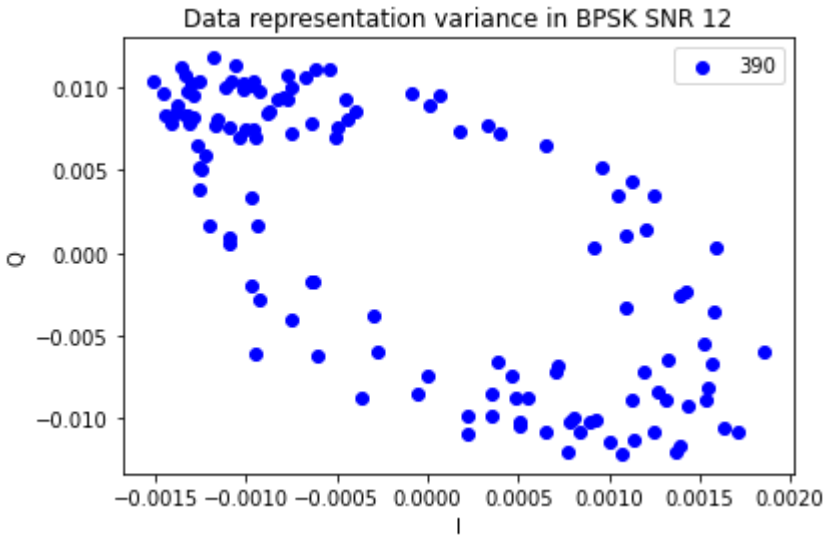
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
390
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0.005
0.000
−0.005
−0.010
Q
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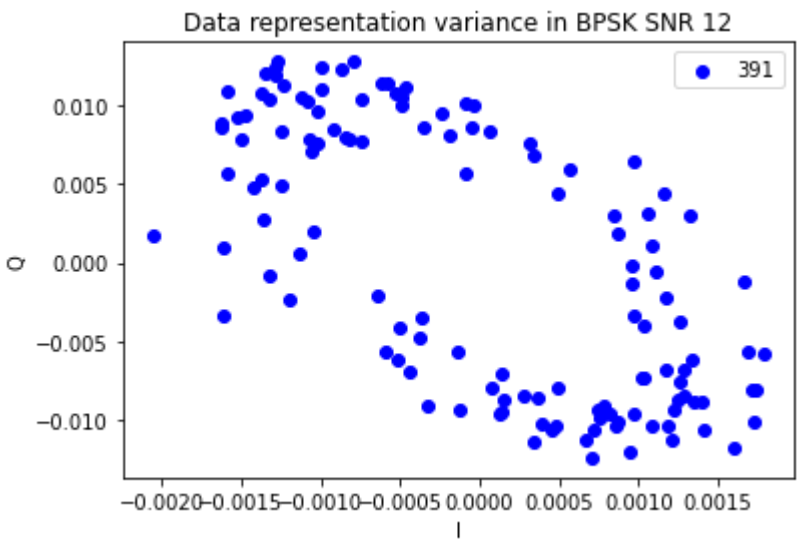
Data representation variance in BPSK SNR 12
391
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0.005
0.000
−0.005
−0.010
Q
−0.0020−0.0015−0.0010−0.0005 0.0000 0.0005 0.0010 0.0015
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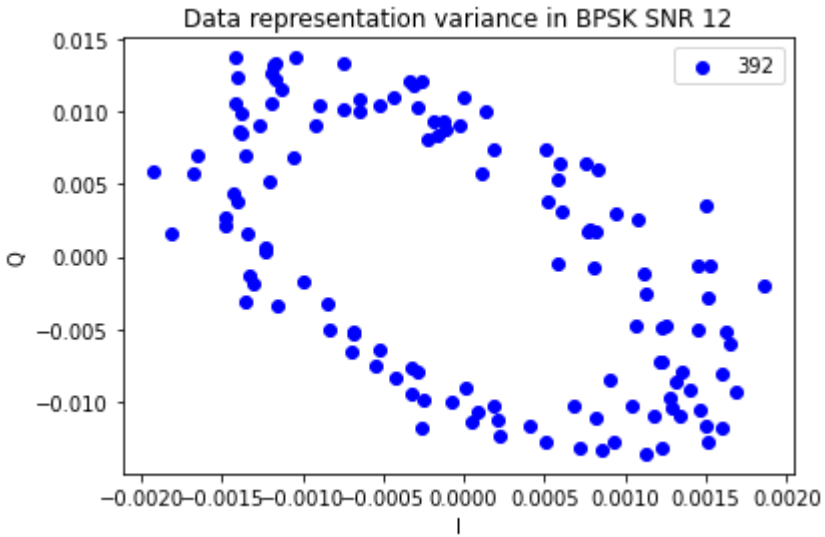
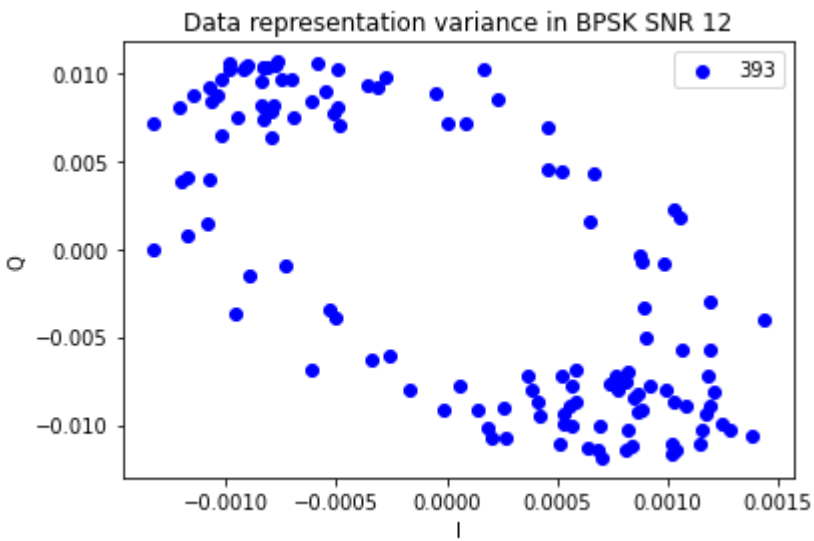
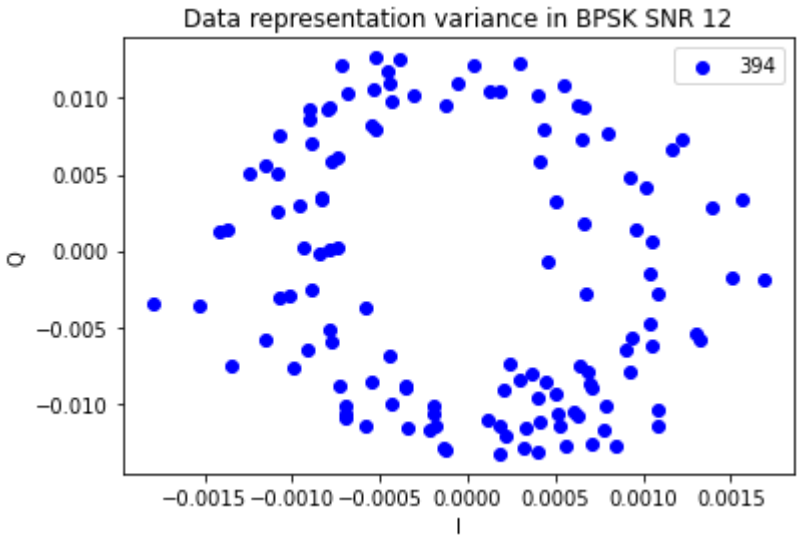

Data representation variance in BPSK SNR 12
392
0.015
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I


Data representation variance in BPSK SNR 12
393
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I


Data representation variance in BPSK SNR 12
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0.005
0.000
−0.005
−0.010
Q
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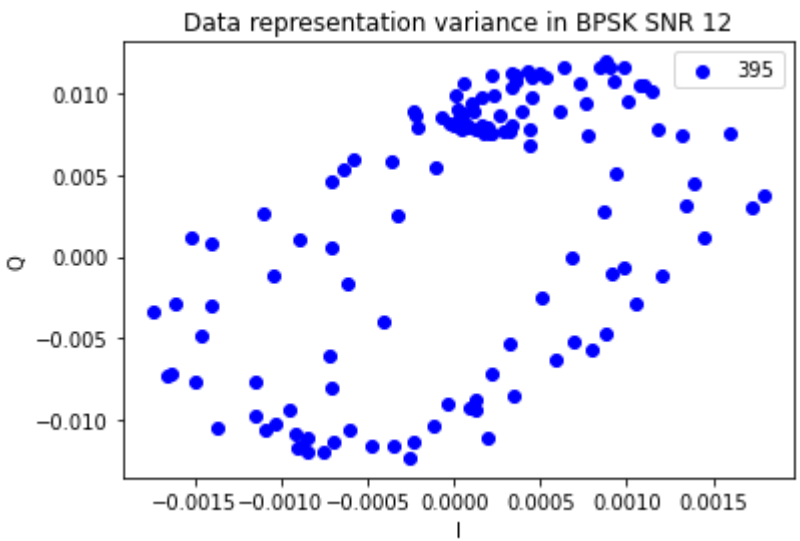
Data representation variance in BPSK SNR 12
395
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0.005
0.000
−0.005
−0.010
Q
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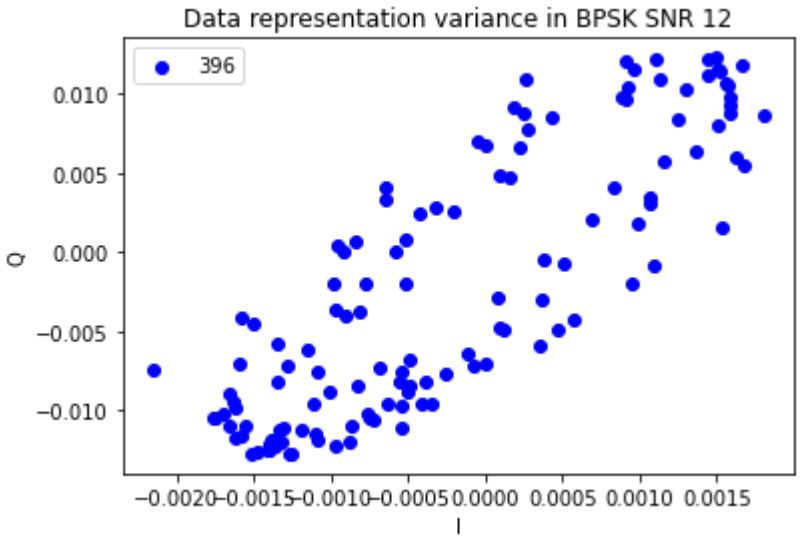
I


Data representation variance in BPSK SNR 12
396
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0.005
0.000
−0.005
−0.010
Q
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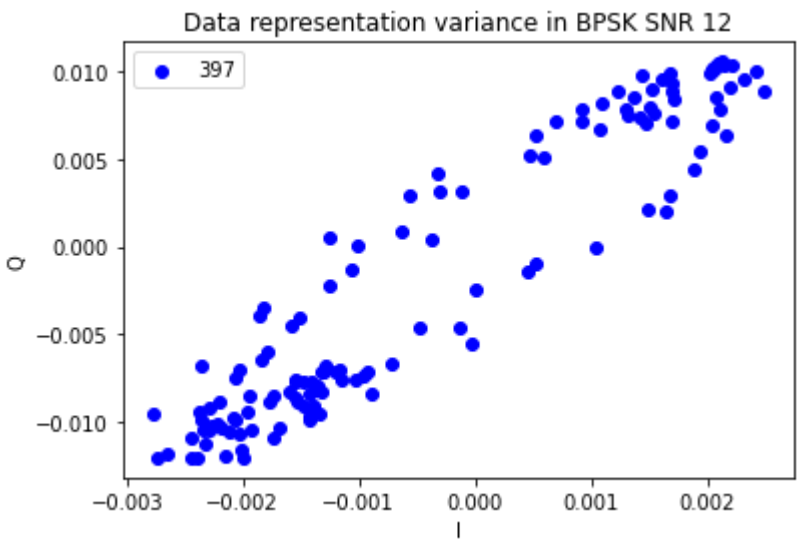
Data representation variance in BPSK SNR 12
397
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002
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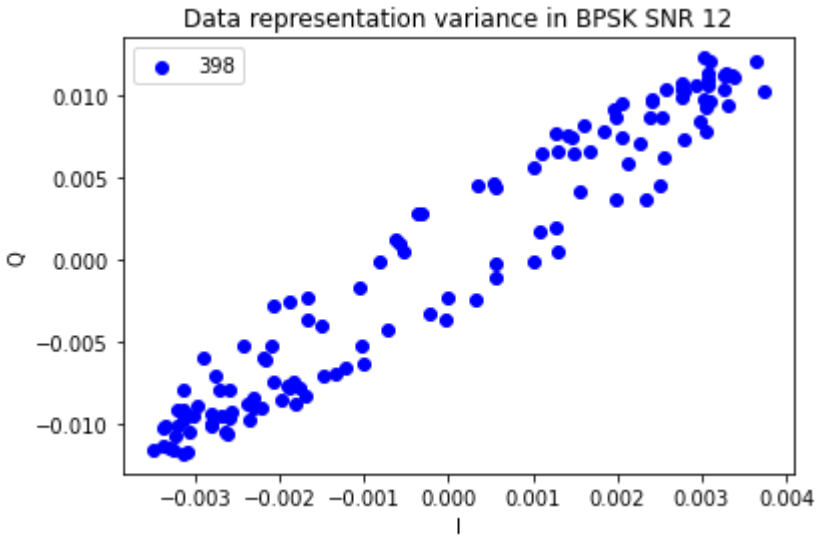
Data representation variance in BPSK SNR 12
398
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.001
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0.004
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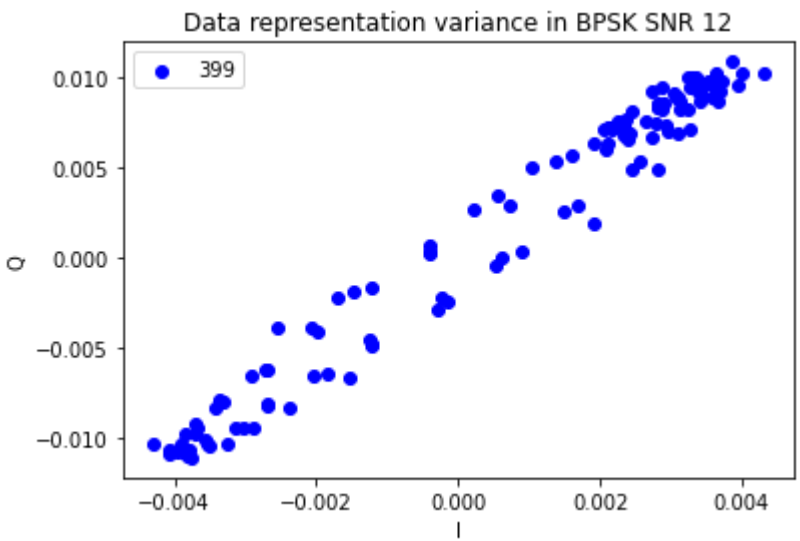
Data representation variance in BPSK SNR 12
399
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
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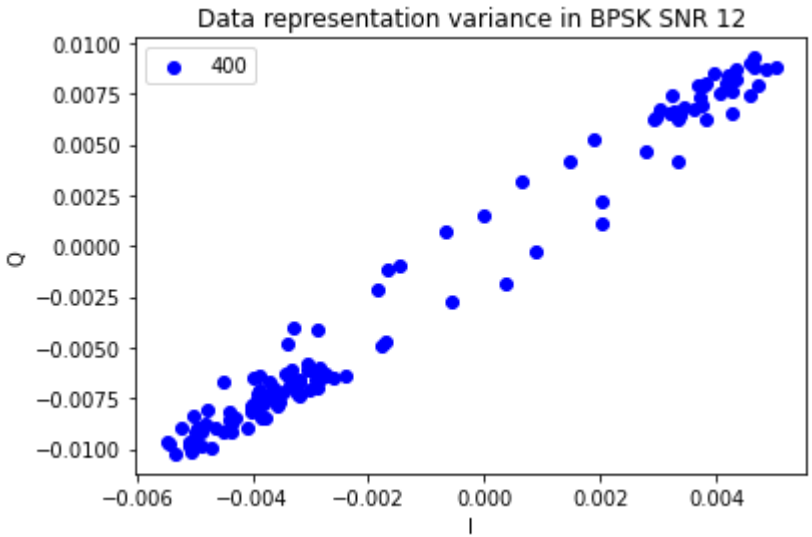
0.002
0.004
I


Data representation variance in BPSK SNR 12
400
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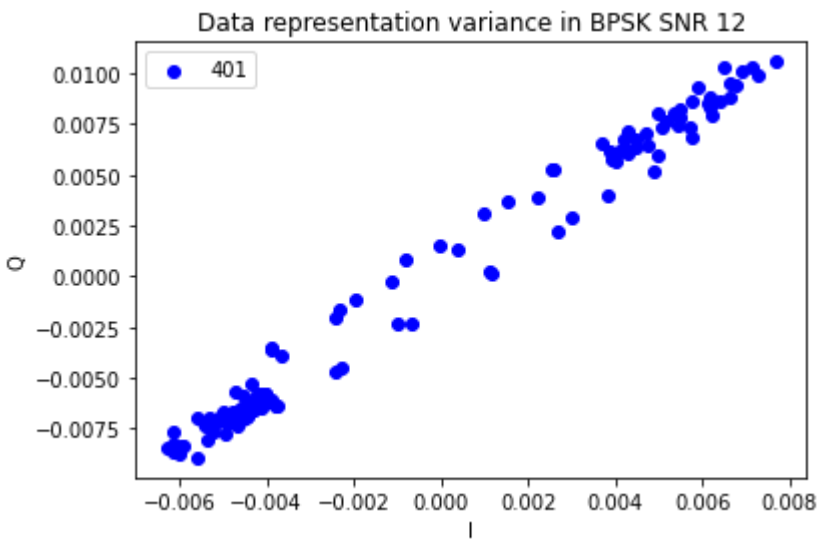
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
401
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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−0.004
−0.002
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0.002
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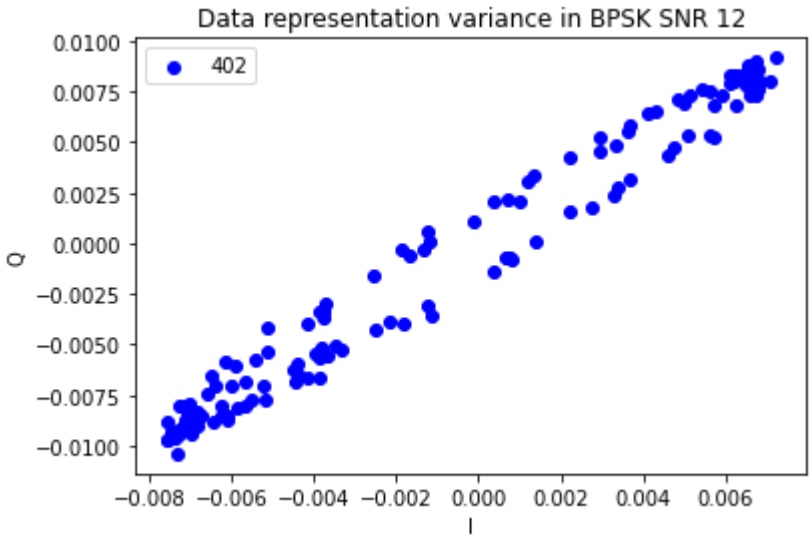
0.006
0.008
I


Data representation variance in BPSK SNR 12
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0.0075
0.0050
0.0025
0.0000
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−0.0075
−0.0100
Q
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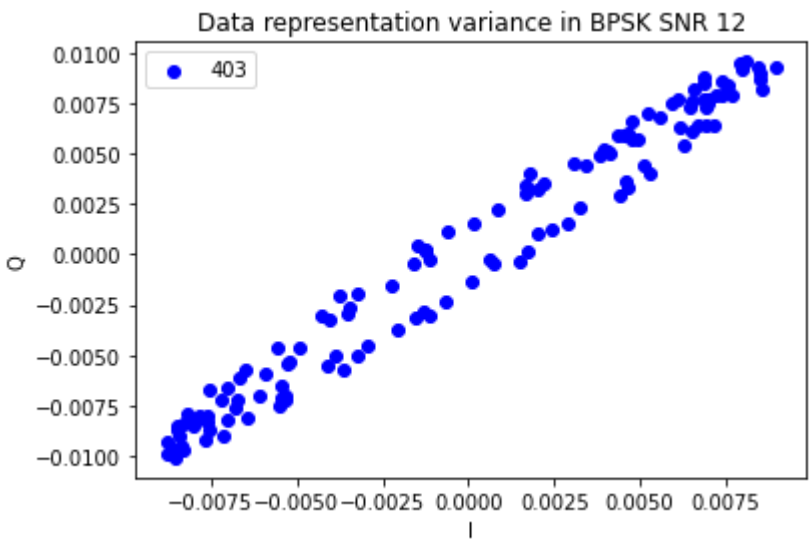
I


Data representation variance in BPSK SNR 12
403
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0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
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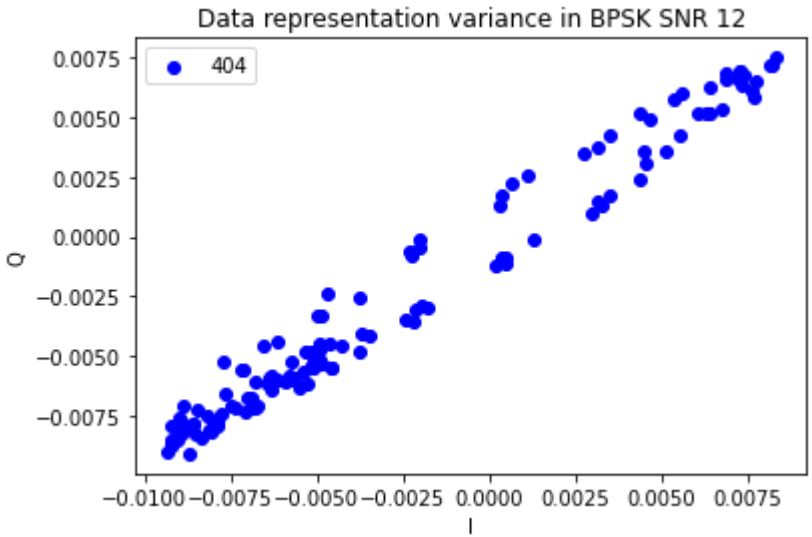
I


Data representation variance in BPSK SNR 12
404
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0.0050
0.0025
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−0.0050
−0.0075
Q
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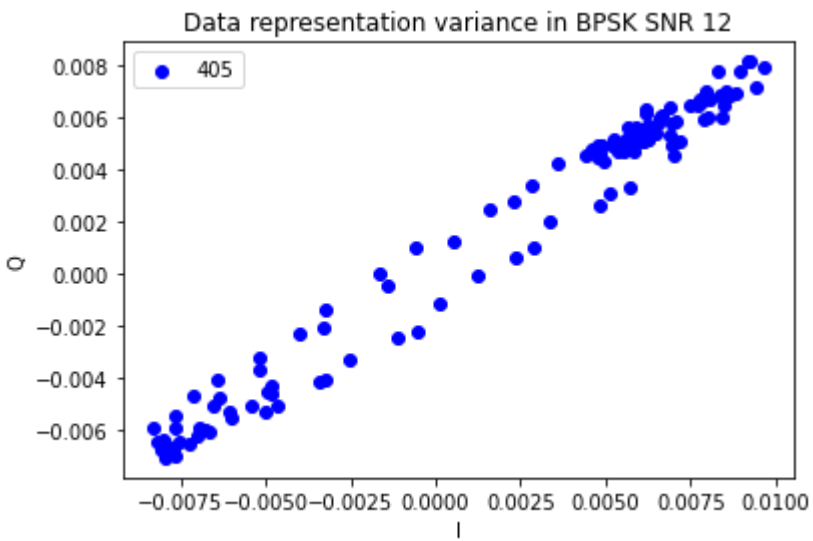
Data representation variance in BPSK SNR 12
405
0.008
0.006
0.004
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−0.004
−0.006
Q
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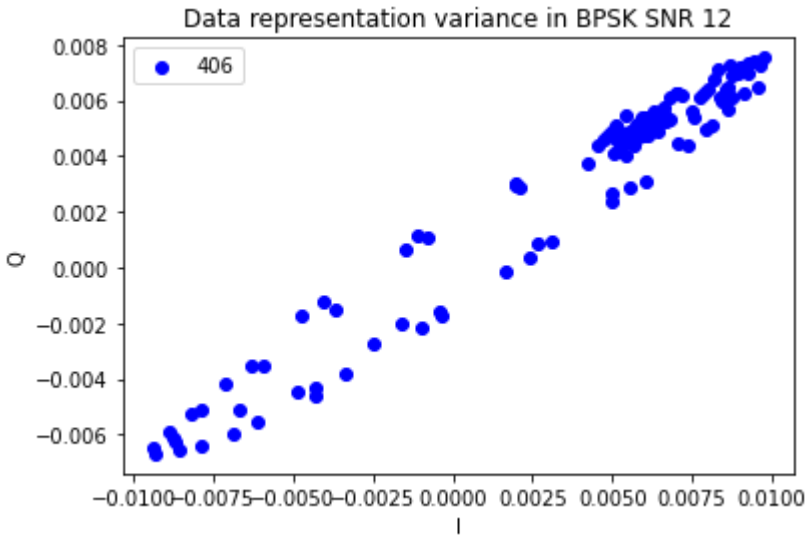
I


Data representation variance in BPSK SNR 12
406
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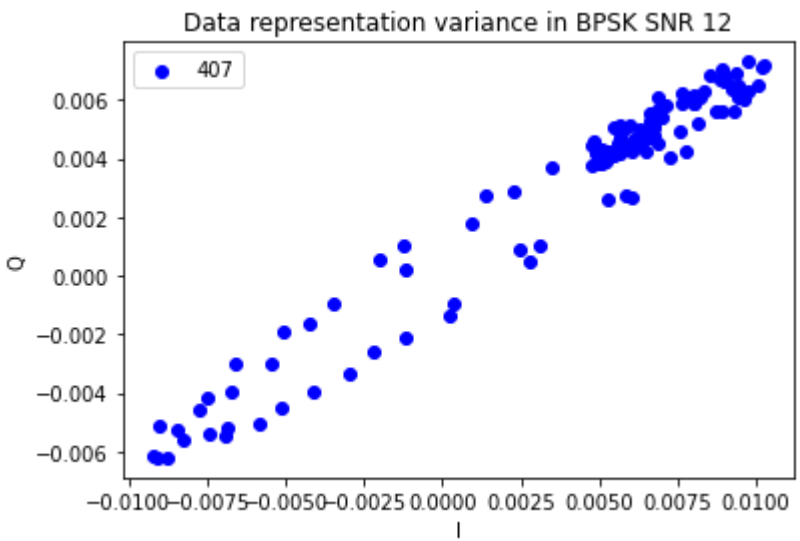
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
407
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0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
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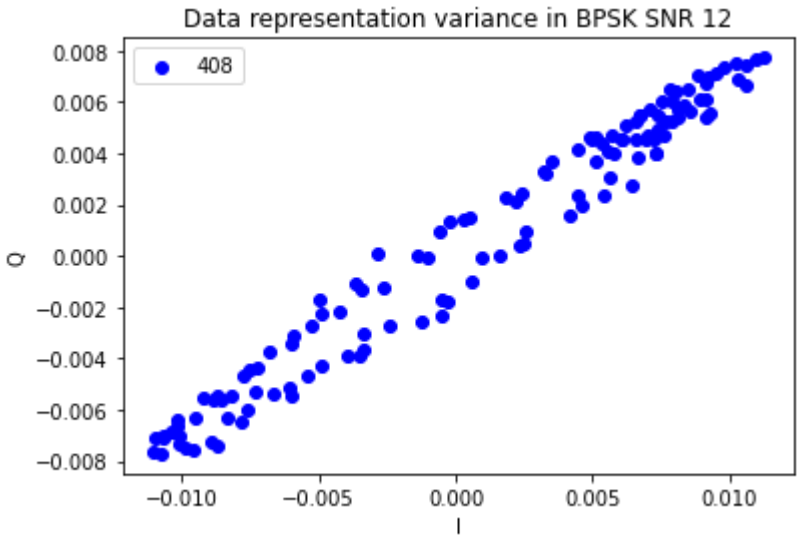
I


Data representation variance in BPSK SNR 12
408
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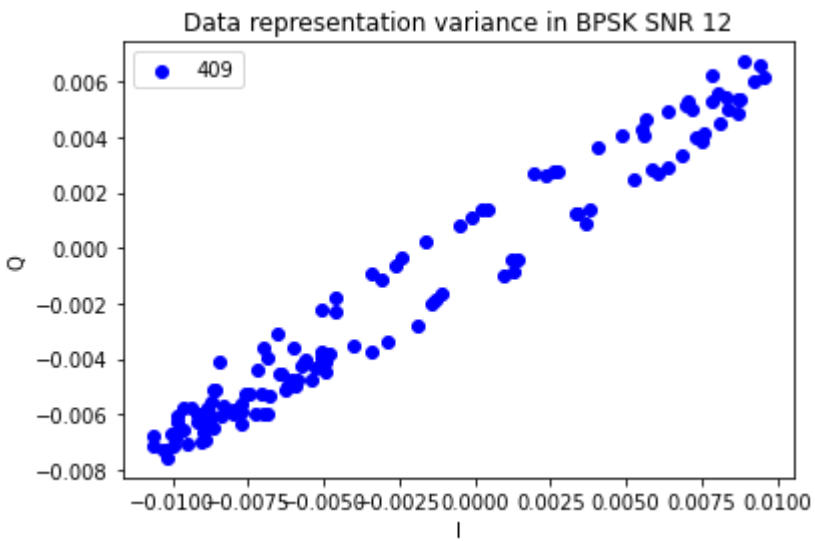
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
409
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100
−0.0075
−0.0050
−0.0025
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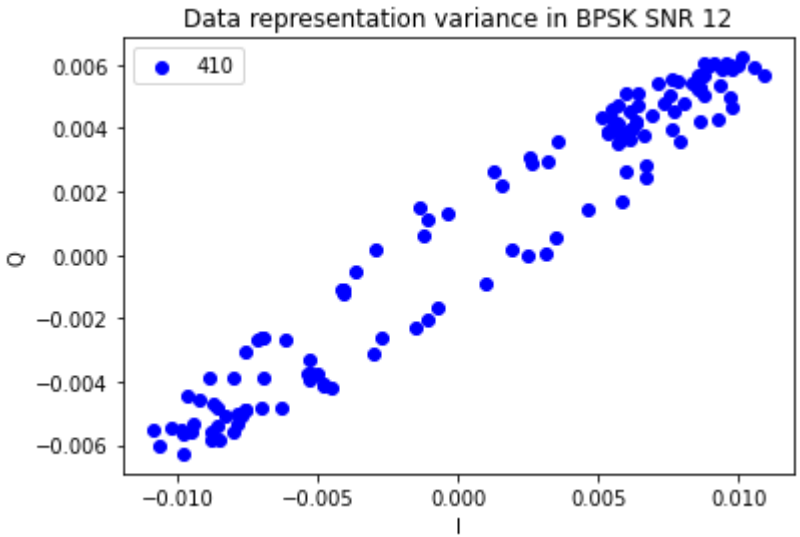
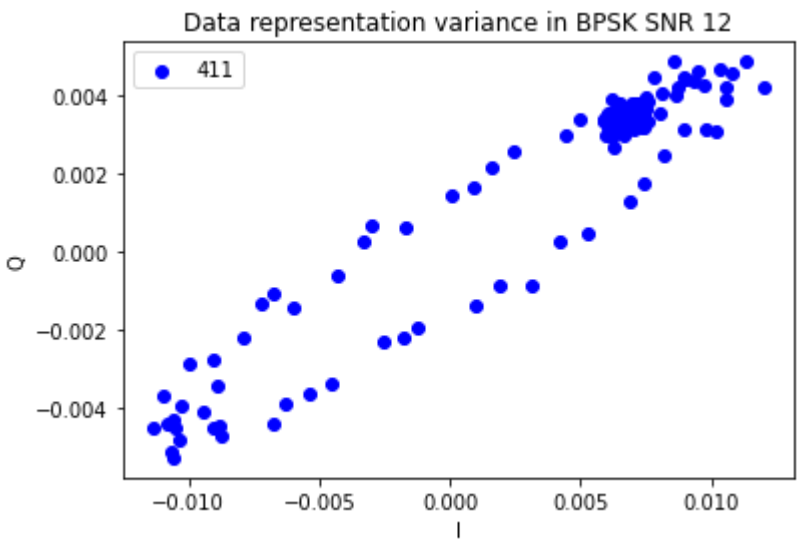
0.0025
0.0050
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
410
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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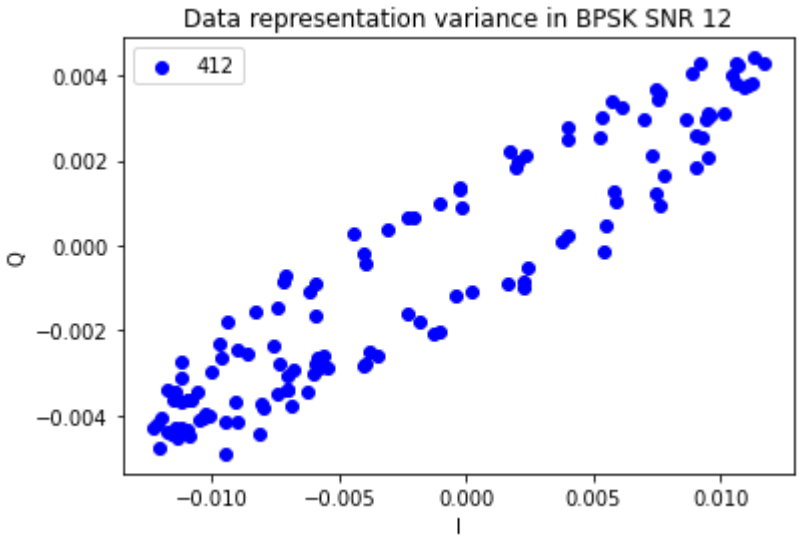
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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0.004
0.002
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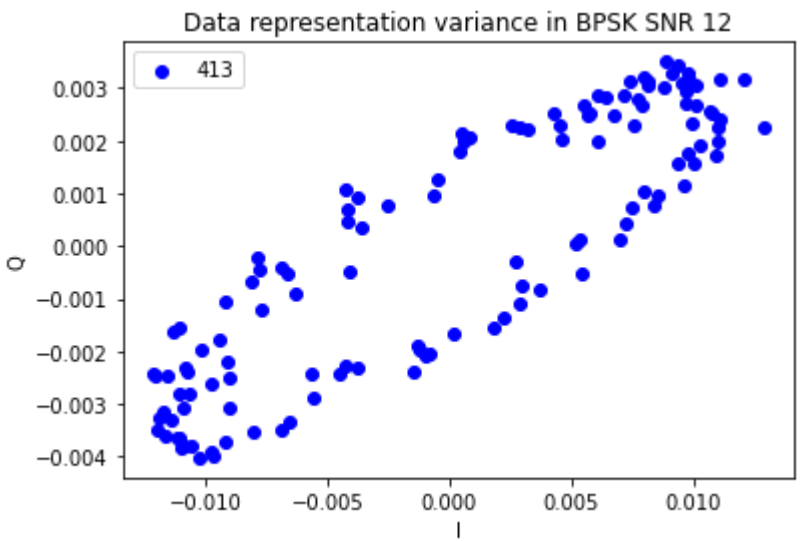
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
413
0.003
0.002
0.001
0.000
−0.001
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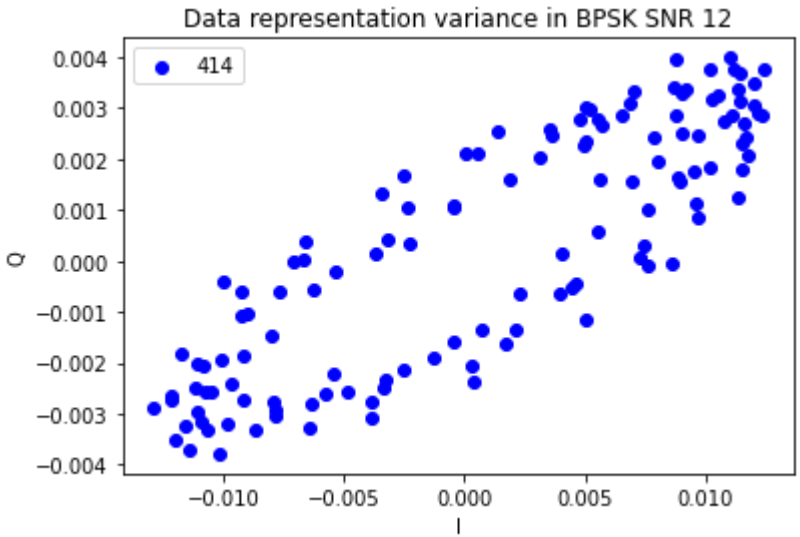
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
414
0.004
0.003
0.002
0.001
0.000
−0.001
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−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
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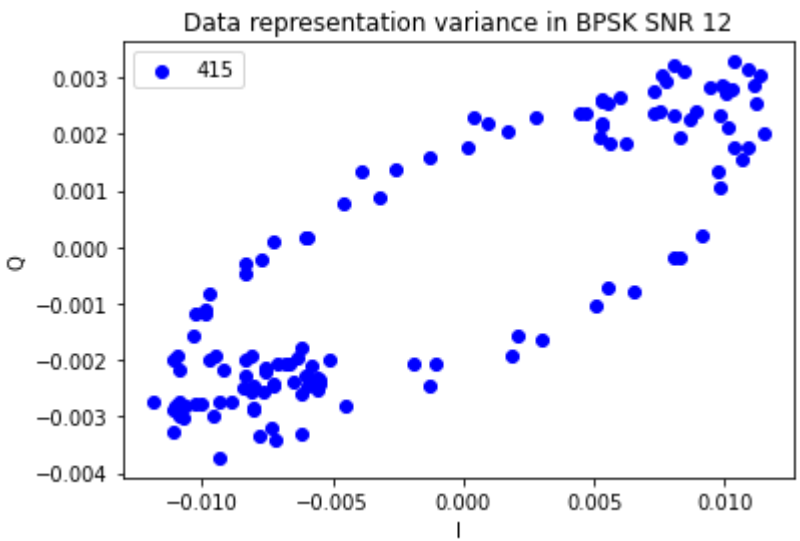
Data representation variance in BPSK SNR 12
415
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
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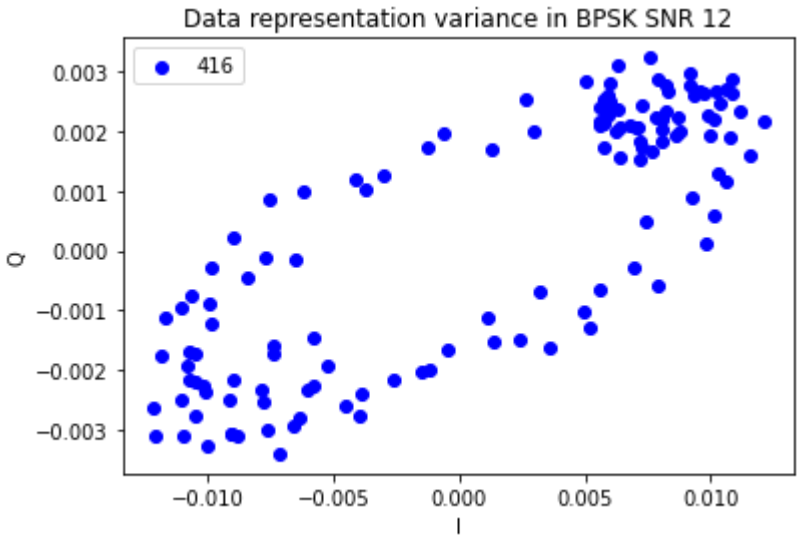
Data representation variance in BPSK SNR 12
416
0.003
0.002
0.001
0.000
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−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
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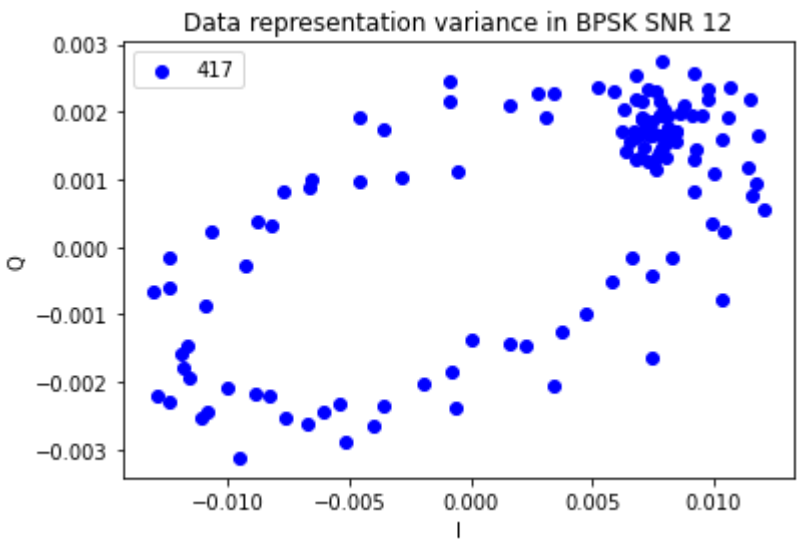
Data representation variance in BPSK SNR 12
417
0.003
0.002
0.001
0.000
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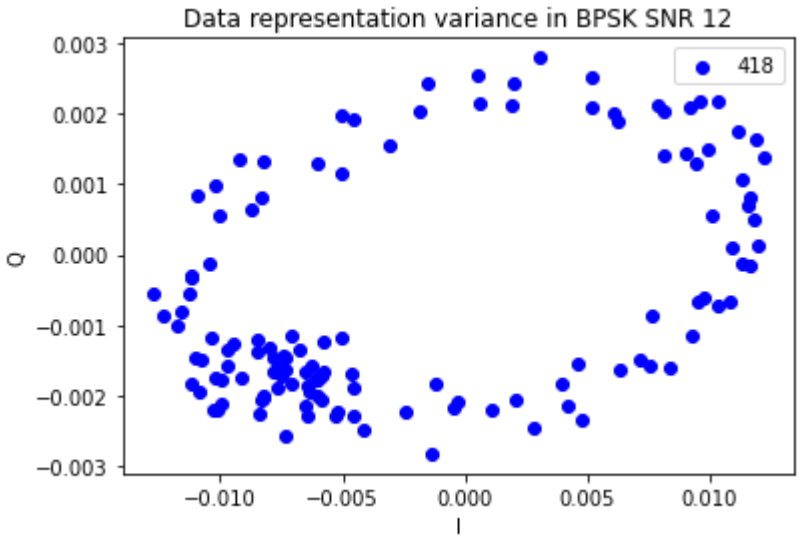
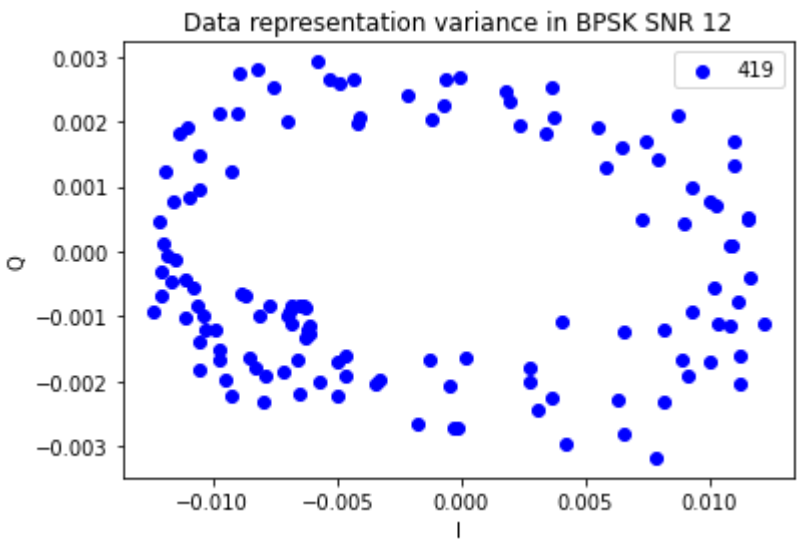
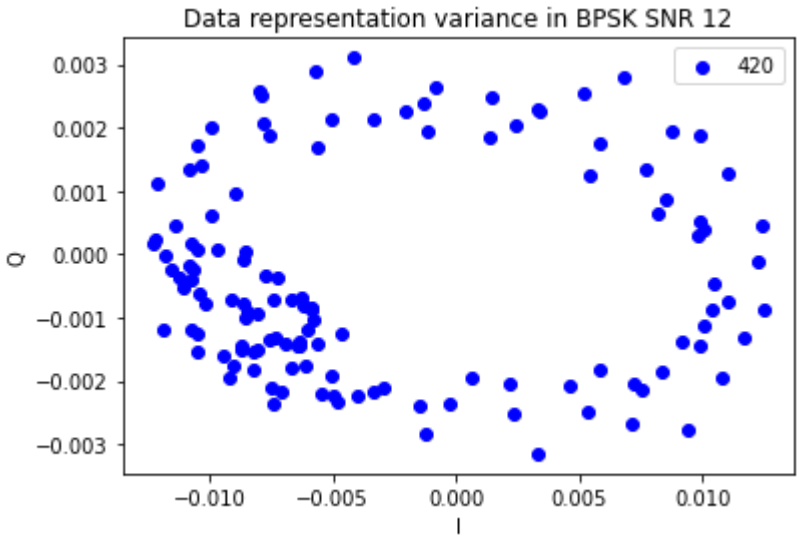
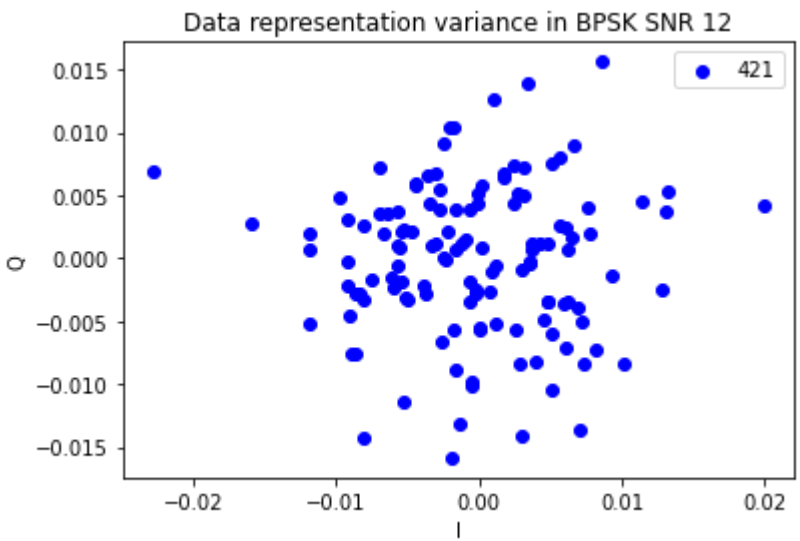
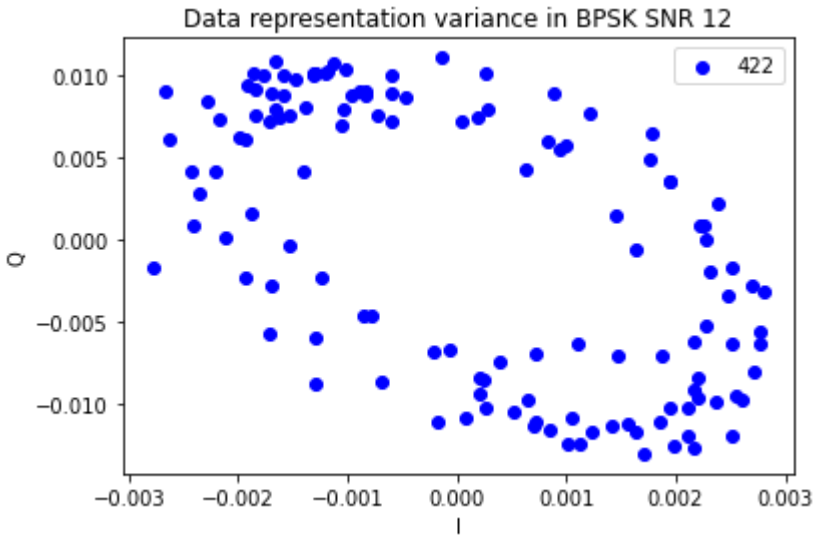
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

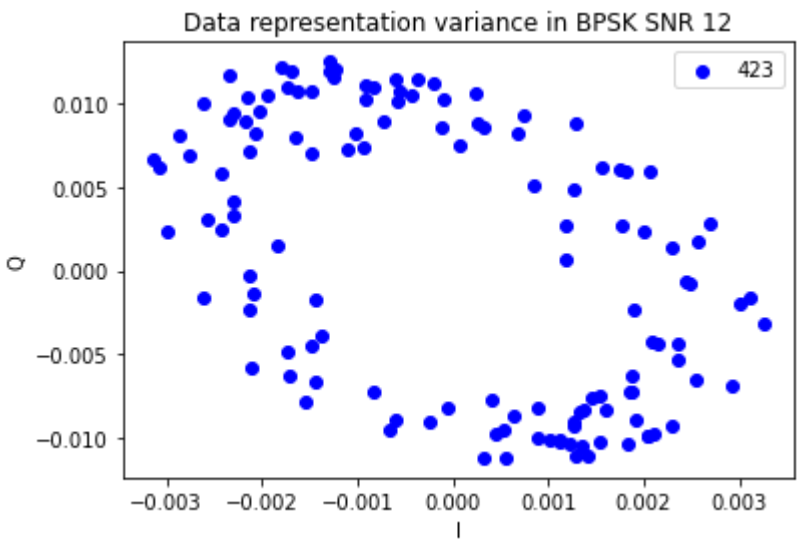

Data representation variance in BPSK SNR 12
418
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

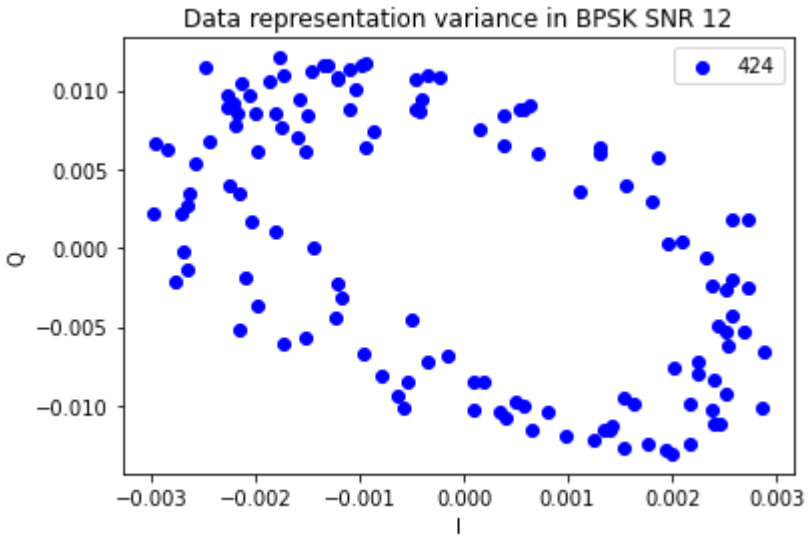

Data representation variance in BPSK SNR 12
419
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

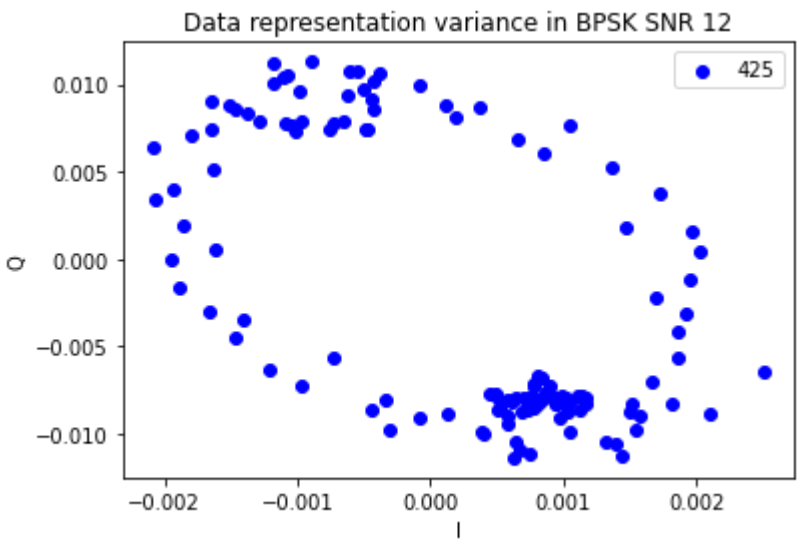

Data representation variance in BPSK SNR 12
420
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

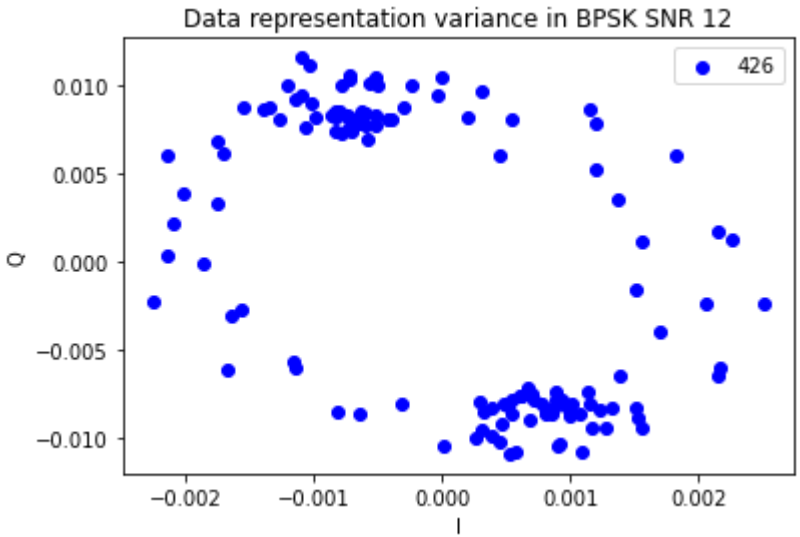

Data representation variance in BPSK SNR 12
421
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.02
−0.01
0.00
0.01
0.02
I

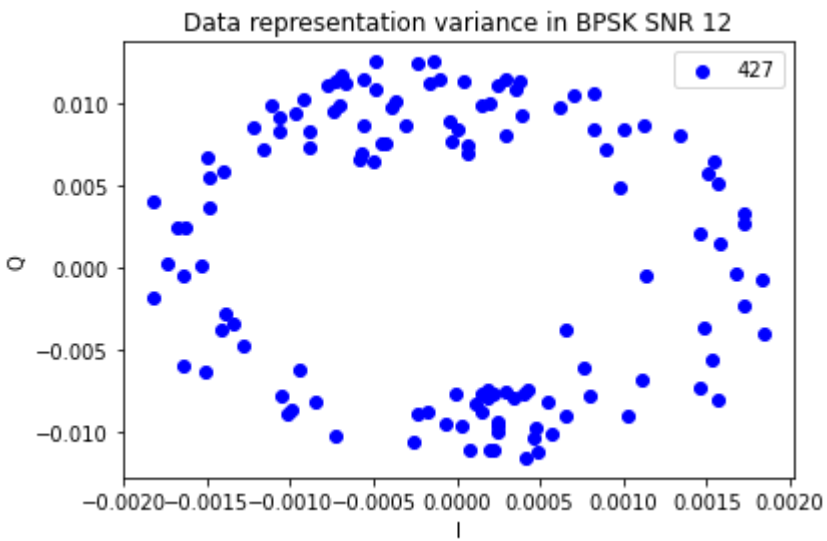

Data representation variance in BPSK SNR 12
422
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
423
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
424
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
425
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
426
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
427
0.010
0.005
0.000
−0.005
−0.010
Q
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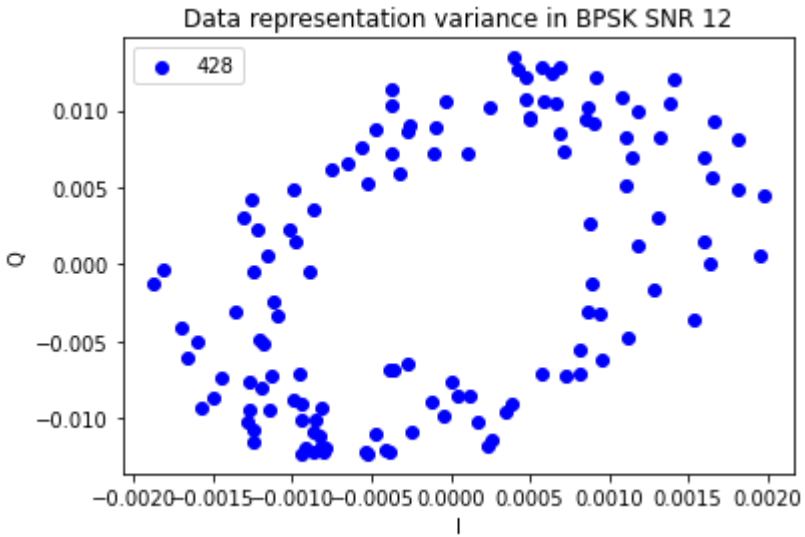
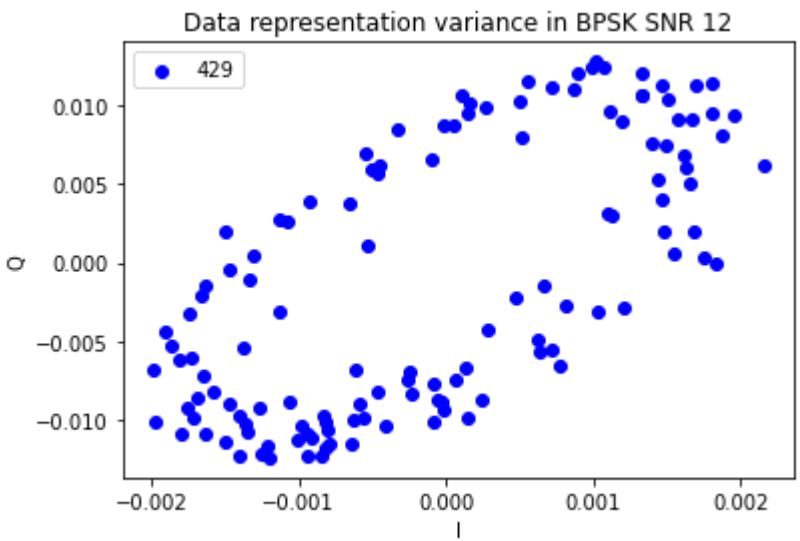
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
I


Data representation variance in BPSK SNR 12
428
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I


Data representation variance in BPSK SNR 12
429
0.010
0.005
0.000
−0.005
−0.010
Q
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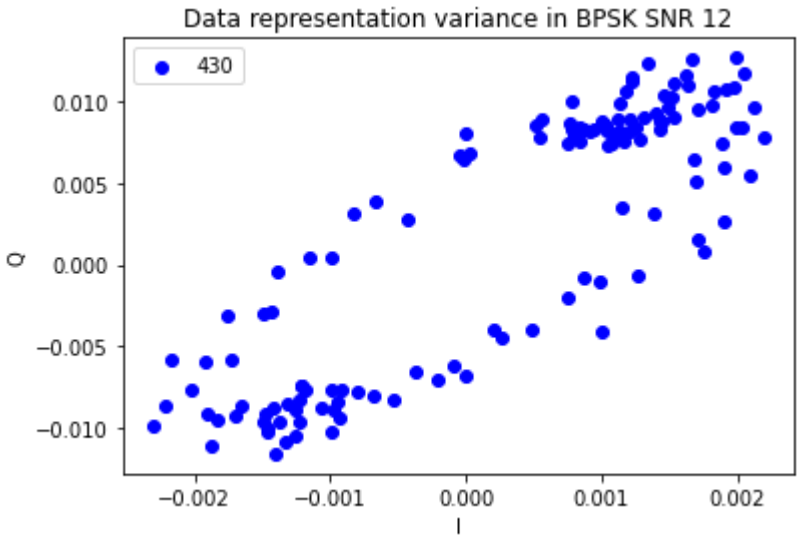
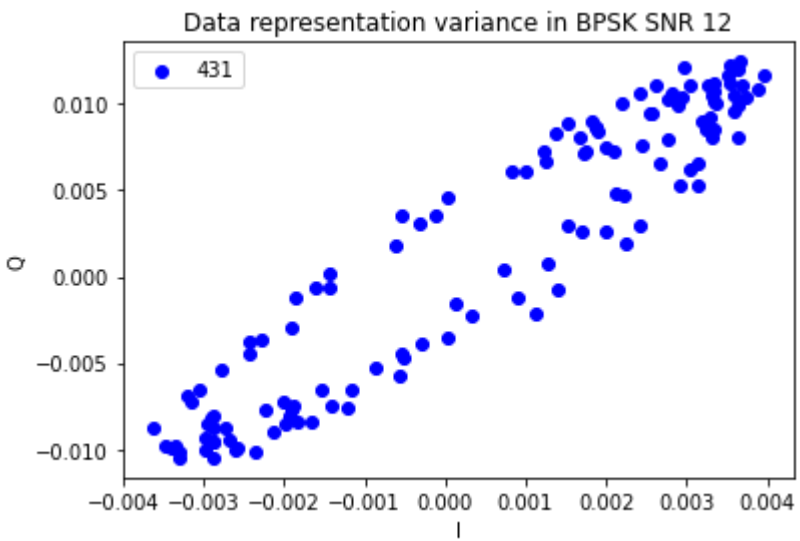
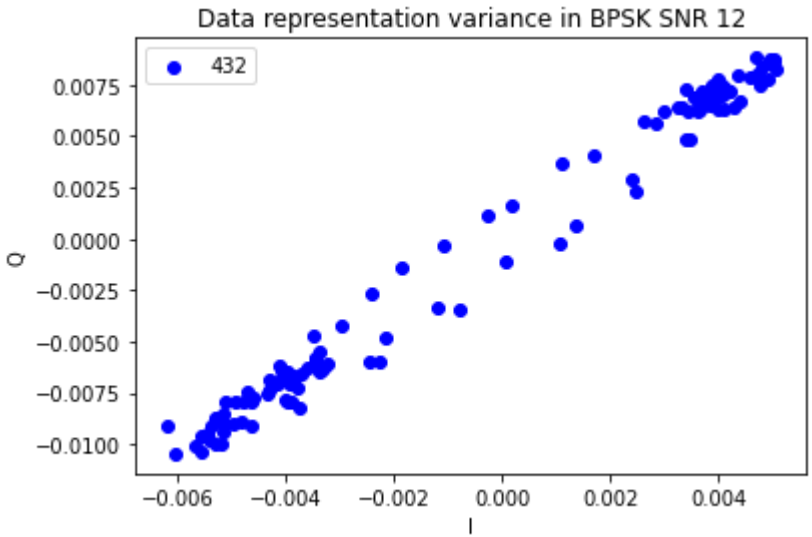
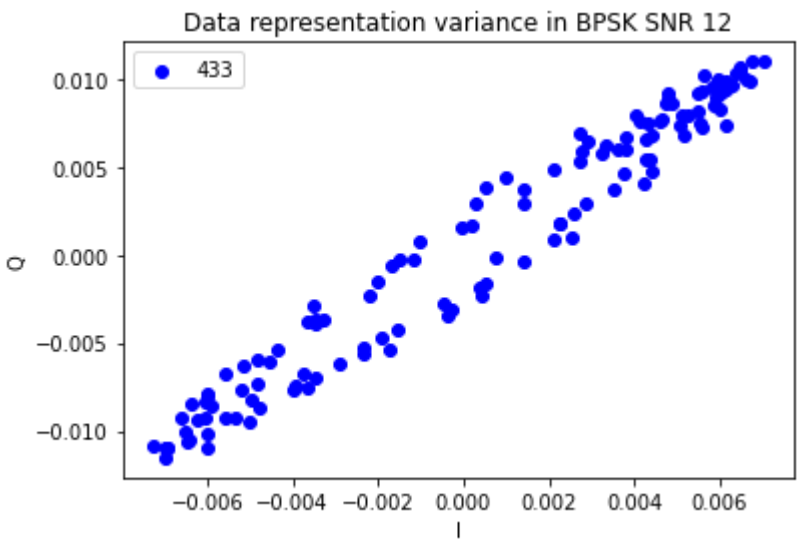
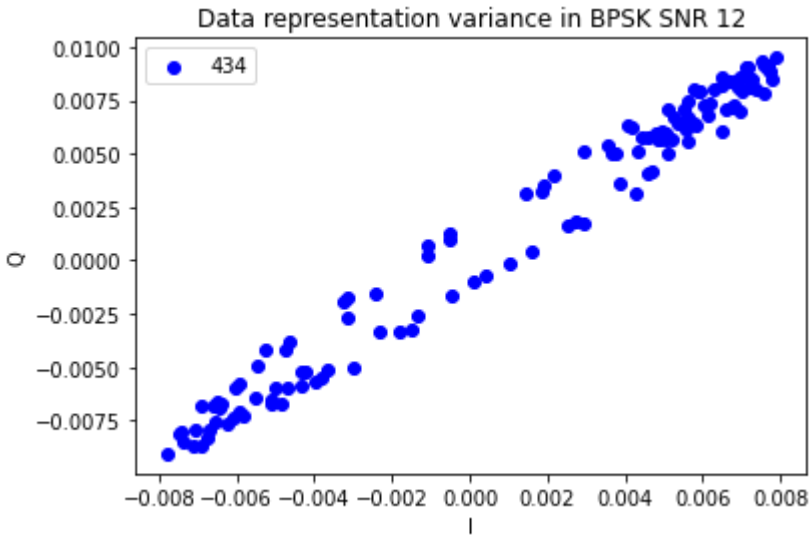
I

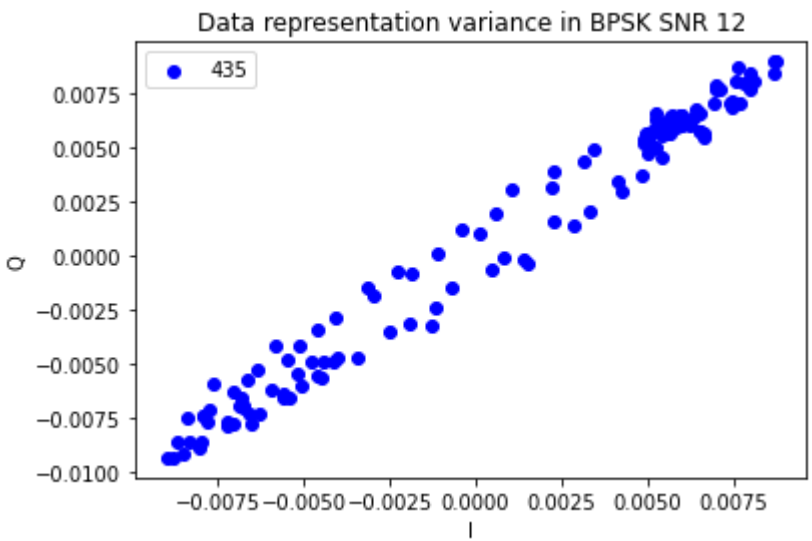

Data representation variance in BPSK SNR 12
430
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

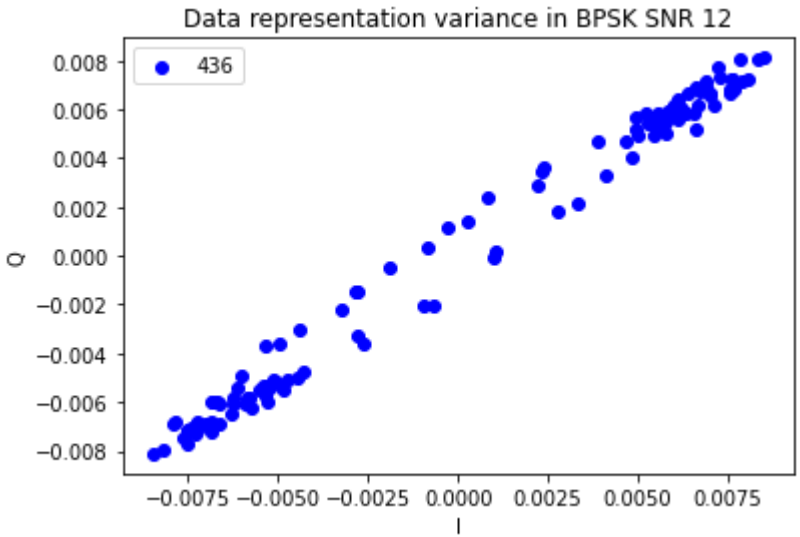

Data representation variance in BPSK SNR 12
431
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I

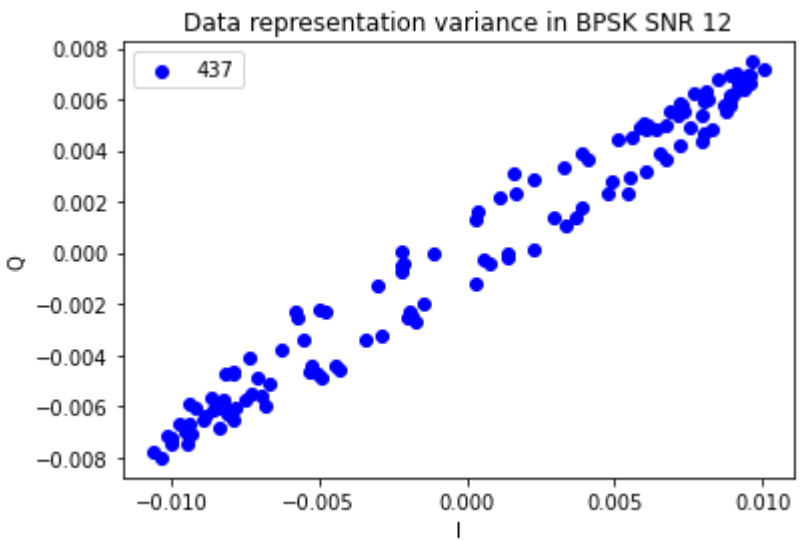

Data representation variance in BPSK SNR 12
432
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I

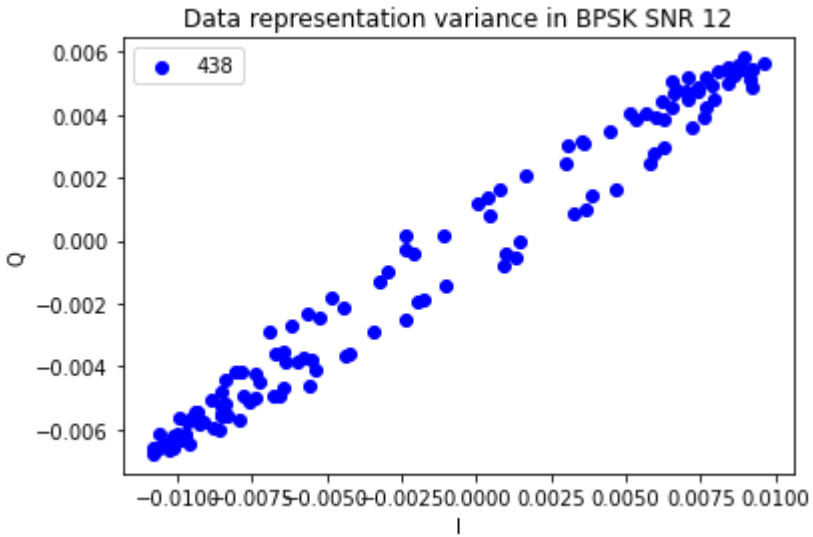

Data representation variance in BPSK SNR 12
433
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

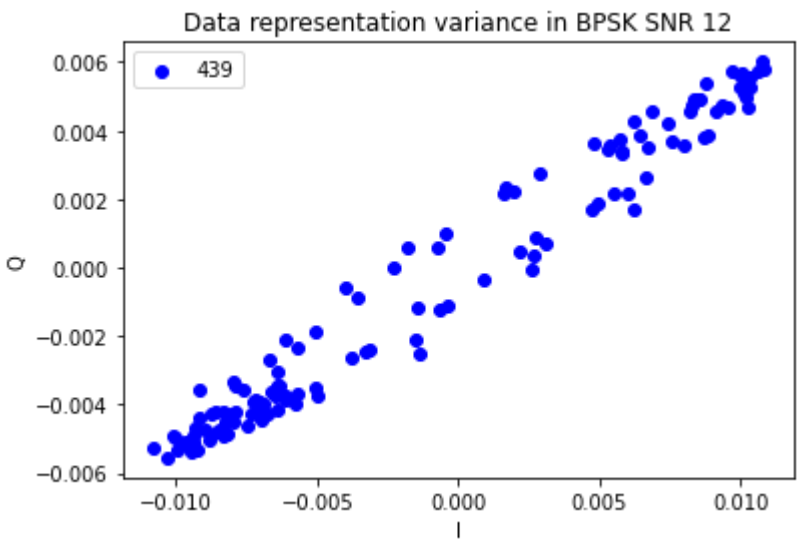

Data representation variance in BPSK SNR 12
434
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

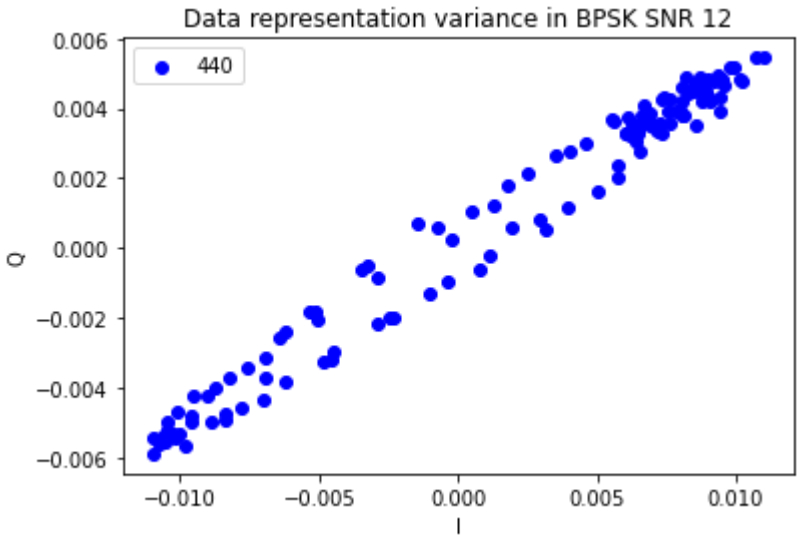

Data representation variance in BPSK SNR 12
435
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

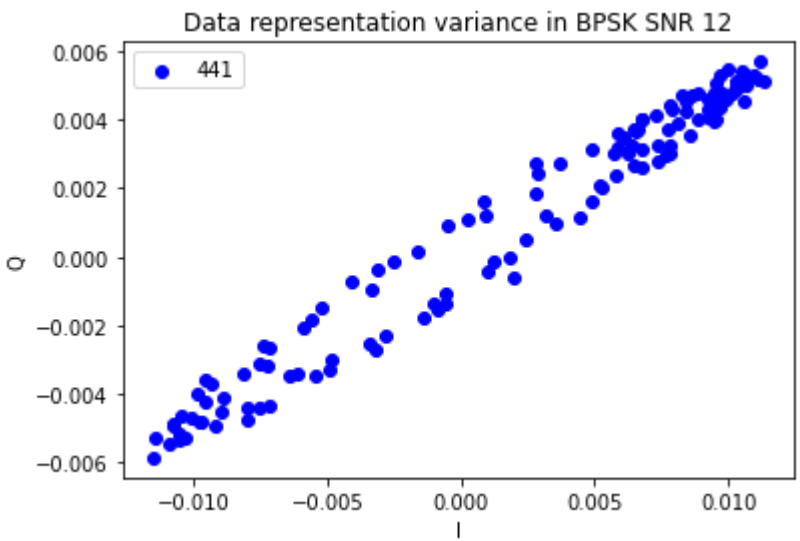

Data representation variance in BPSK SNR 12
436
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

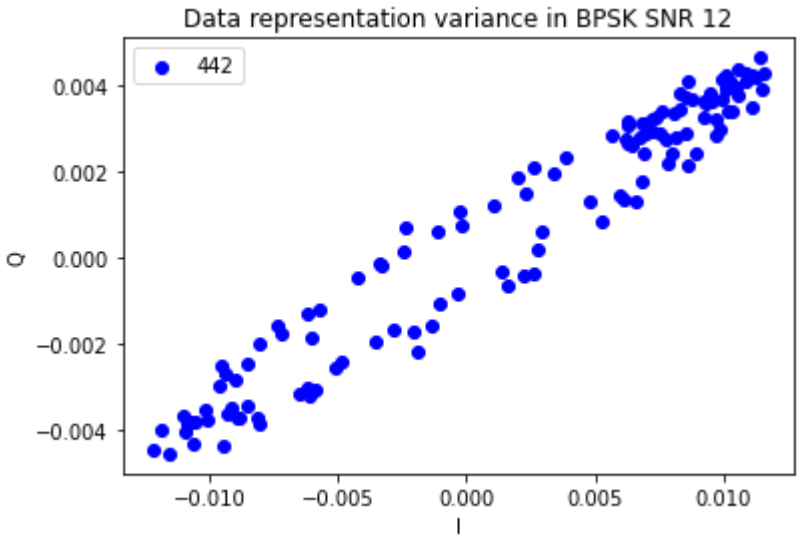

Data representation variance in BPSK SNR 12
437
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010 −0.005 0.000 0.005 0.010
I

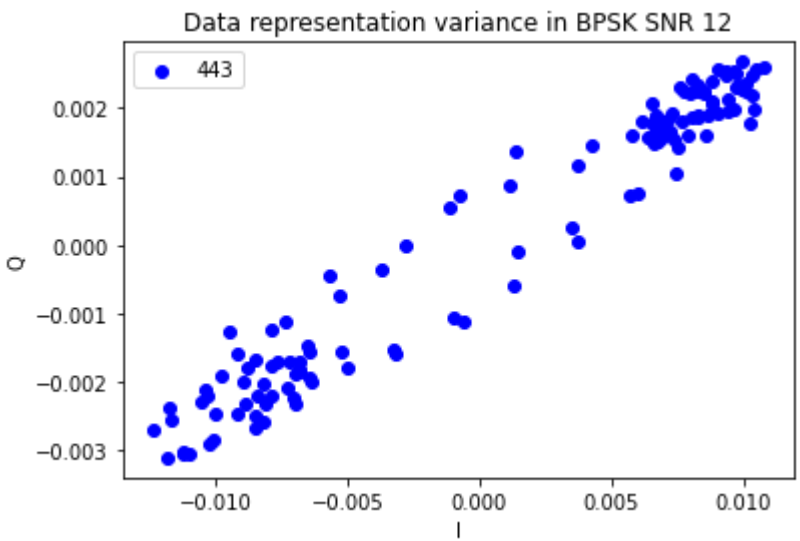

Data representation variance in BPSK SNR 12
438
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

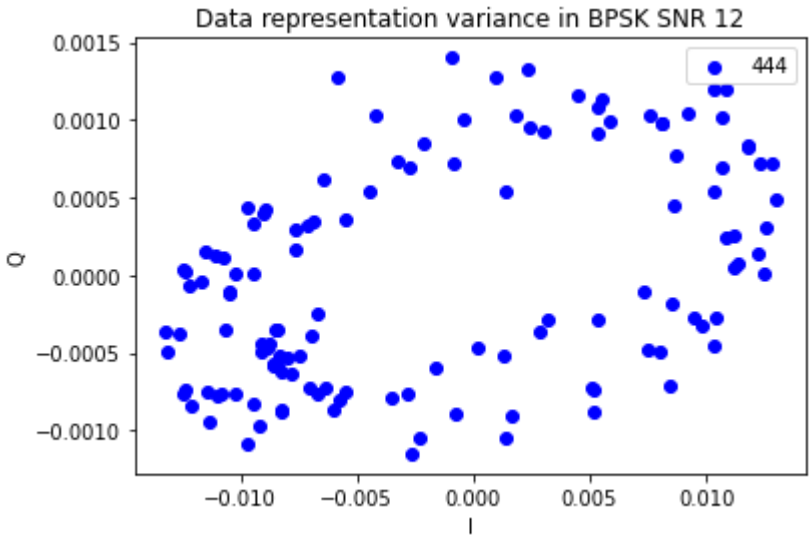

Data representation variance in BPSK SNR 12
439
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

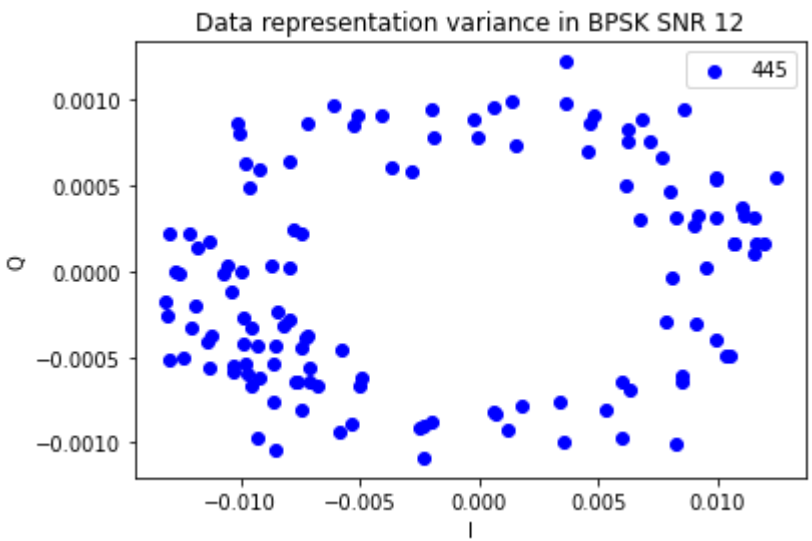

Data representation variance in BPSK SNR 12
440
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

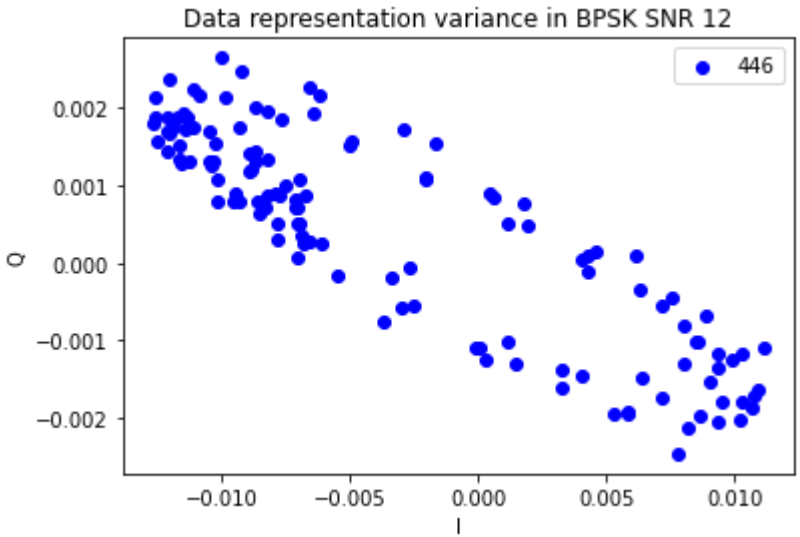

Data representation variance in BPSK SNR 12
441
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

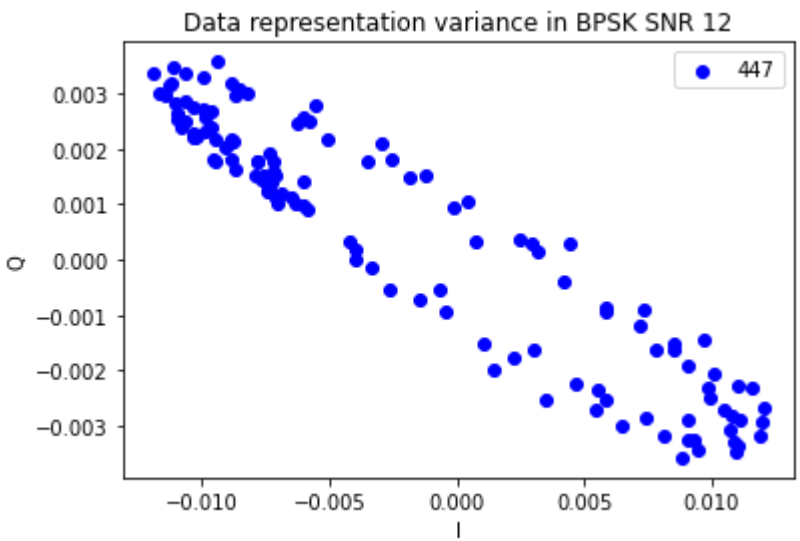

Data representation variance in BPSK SNR 12
442
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

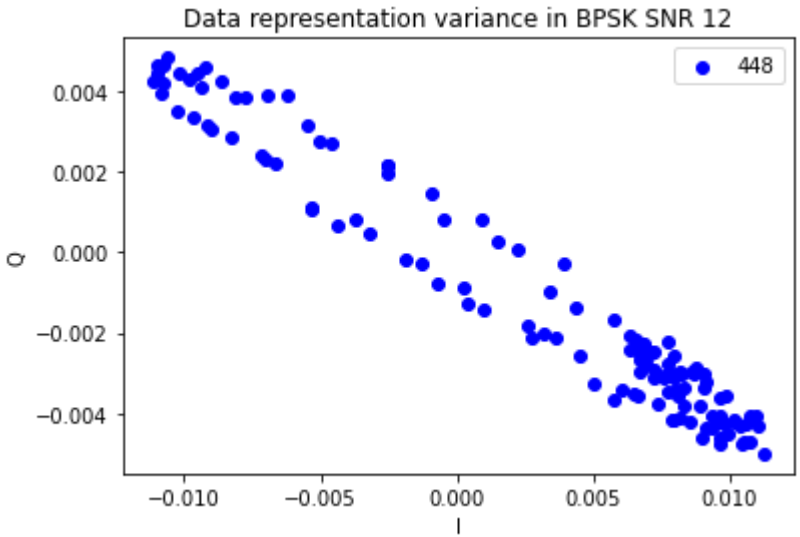

Data representation variance in BPSK SNR 12
443
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

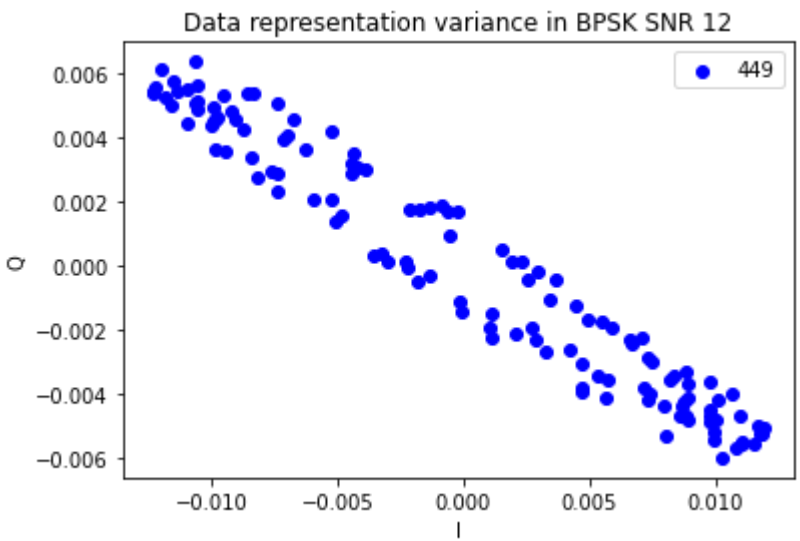

Data representation variance in BPSK SNR 12
444
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

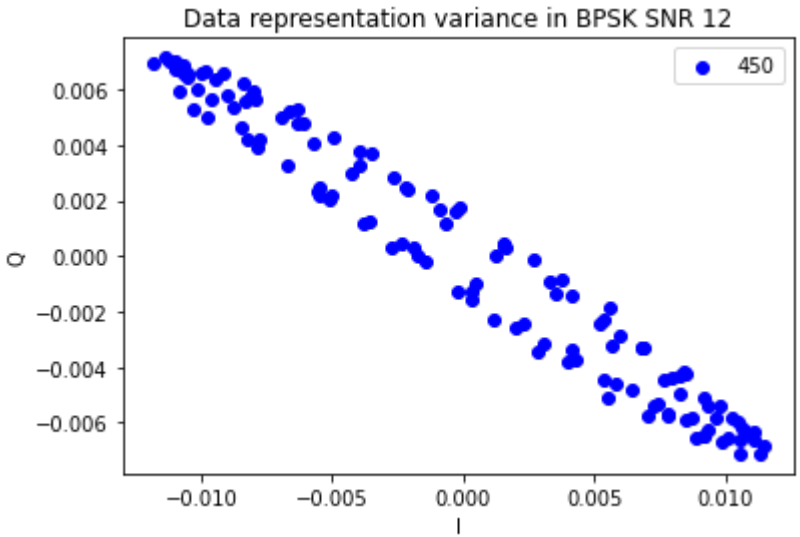

Data representation variance in BPSK SNR 12
445
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

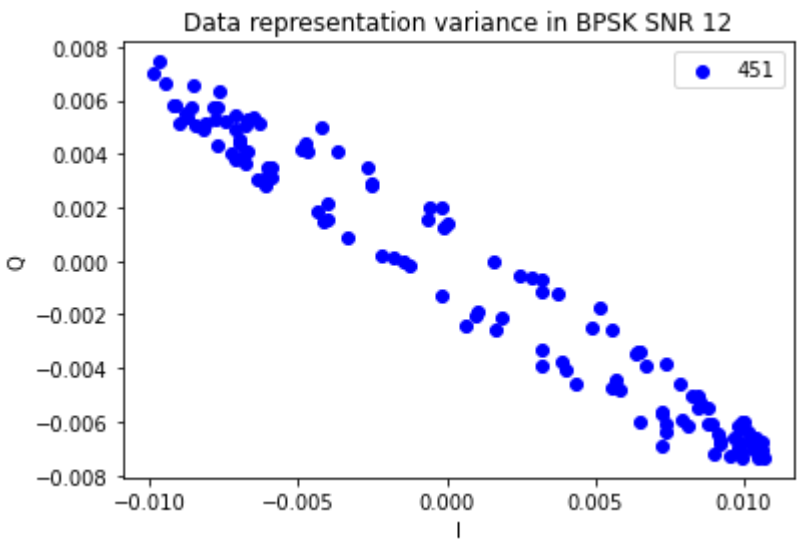

Data representation variance in BPSK SNR 12
446
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

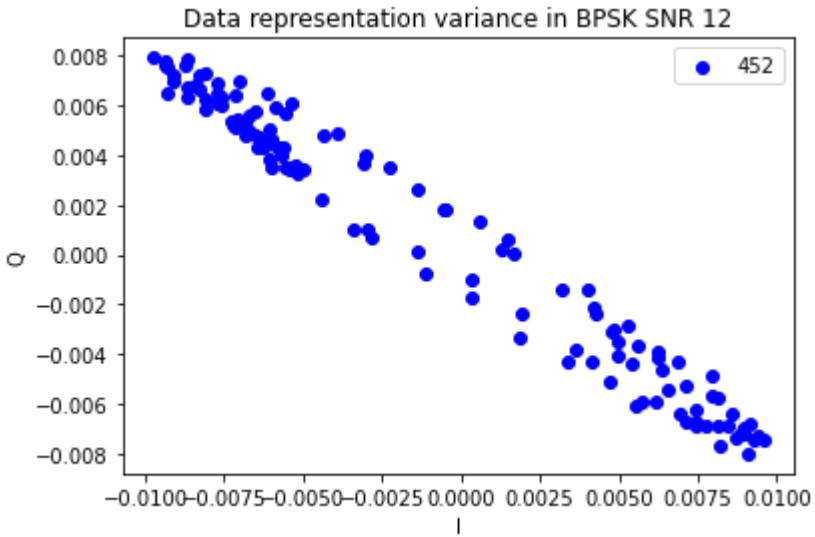

Data representation variance in BPSK SNR 12
447
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
448
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
449
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
450
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
451
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
452
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
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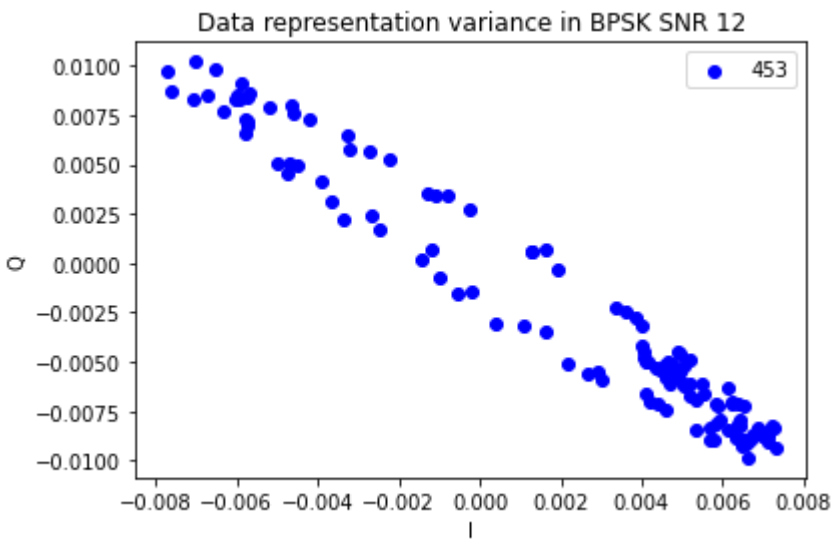
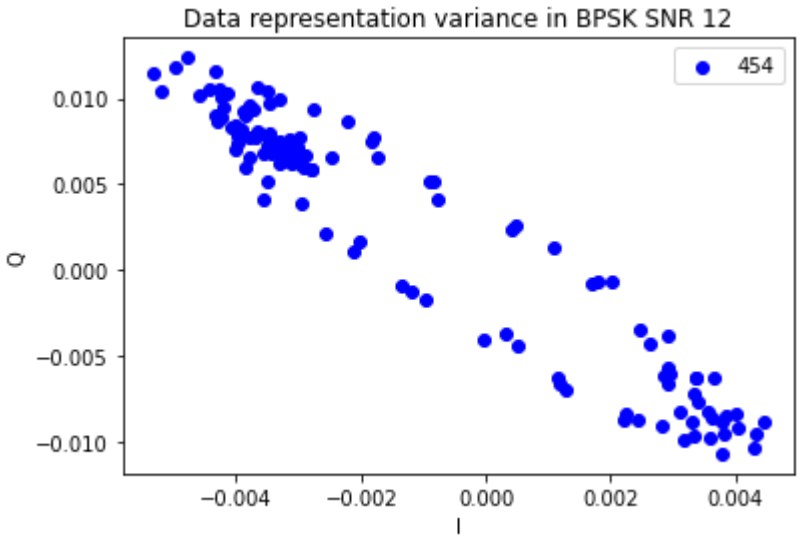
I


Data representation variance in BPSK SNR 12
453
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
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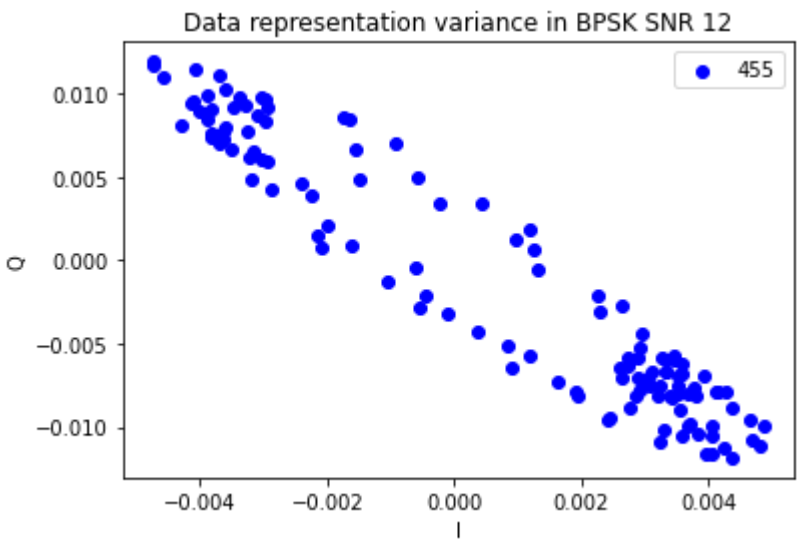
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
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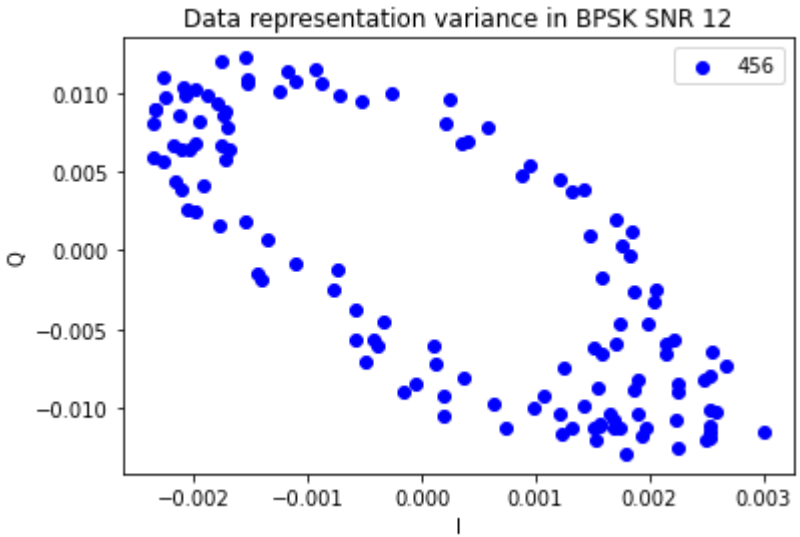
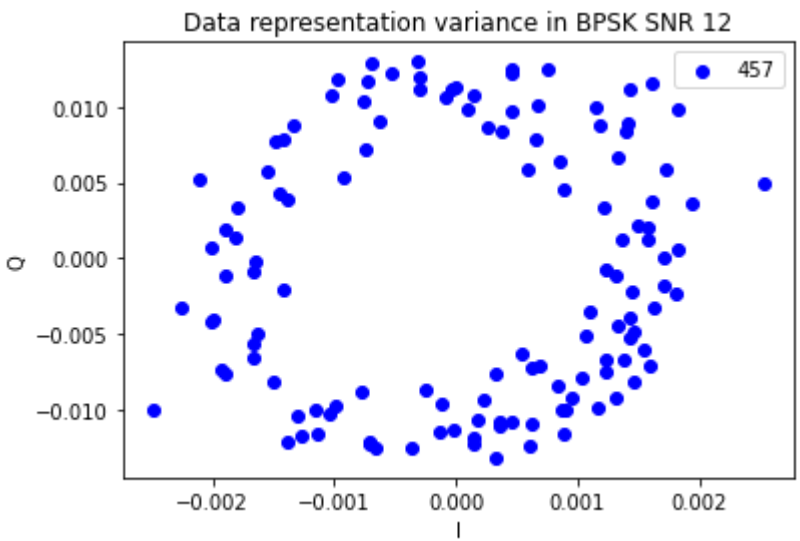
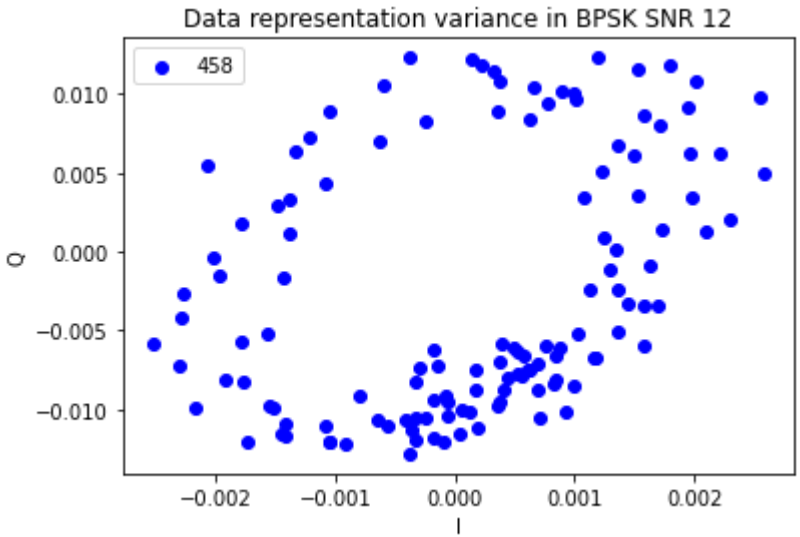
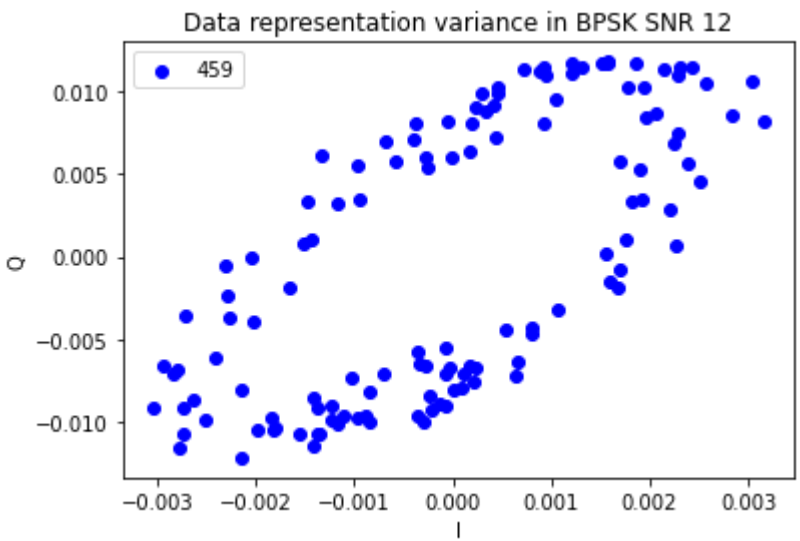
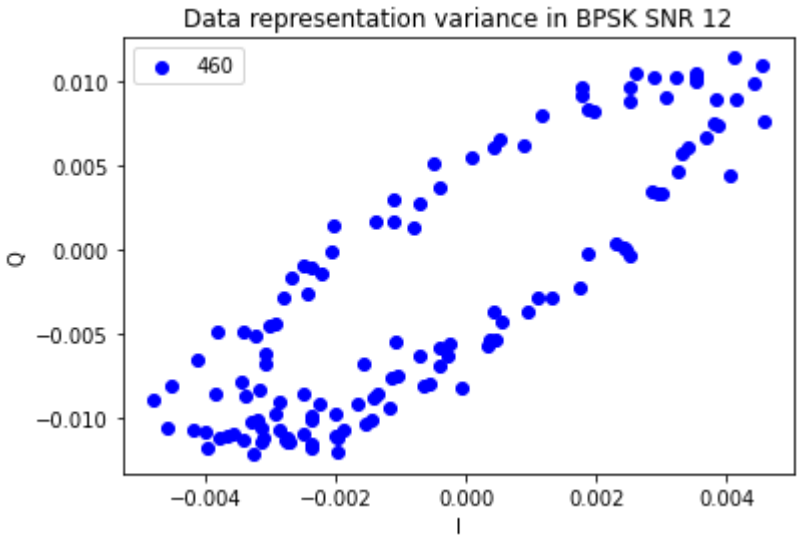
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

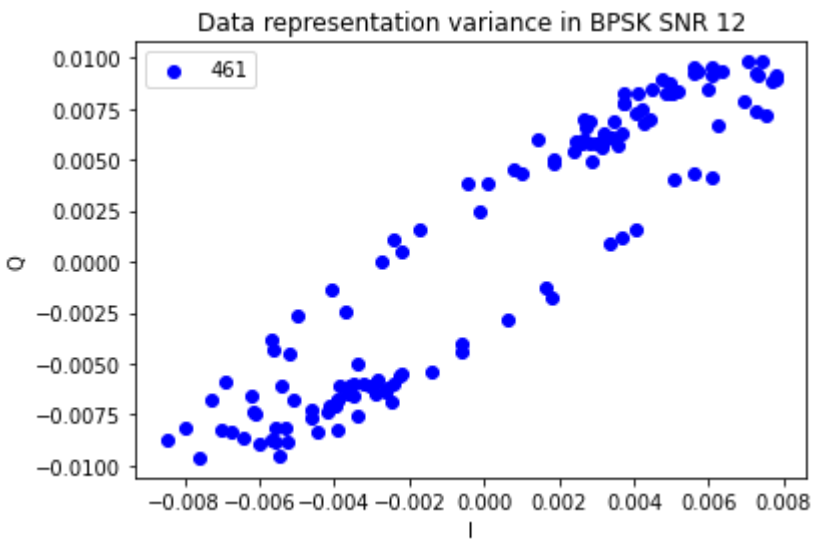

Data representation variance in BPSK SNR 12
456
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
457
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
458
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
459
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
460
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
461
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
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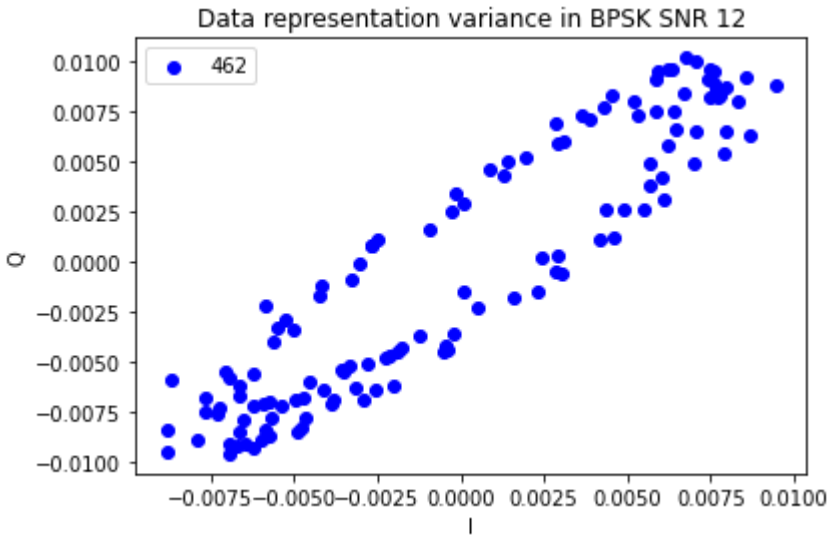
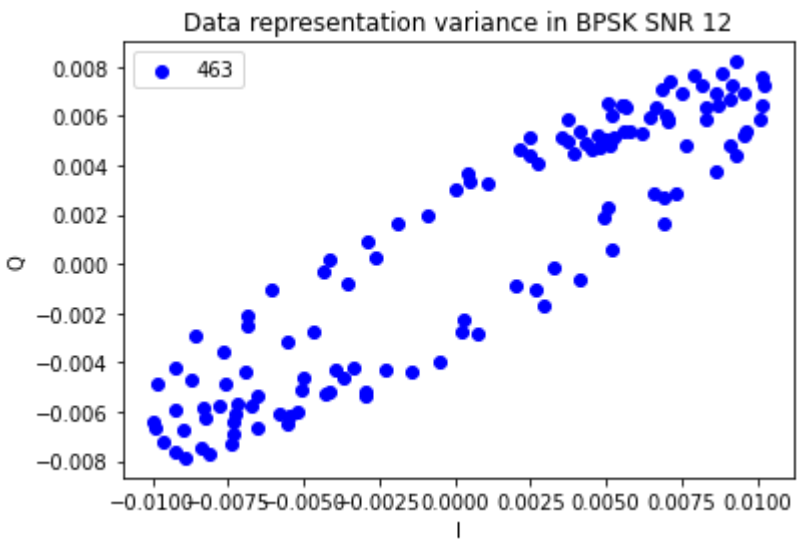
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I


Data representation variance in BPSK SNR 12
462
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
463
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
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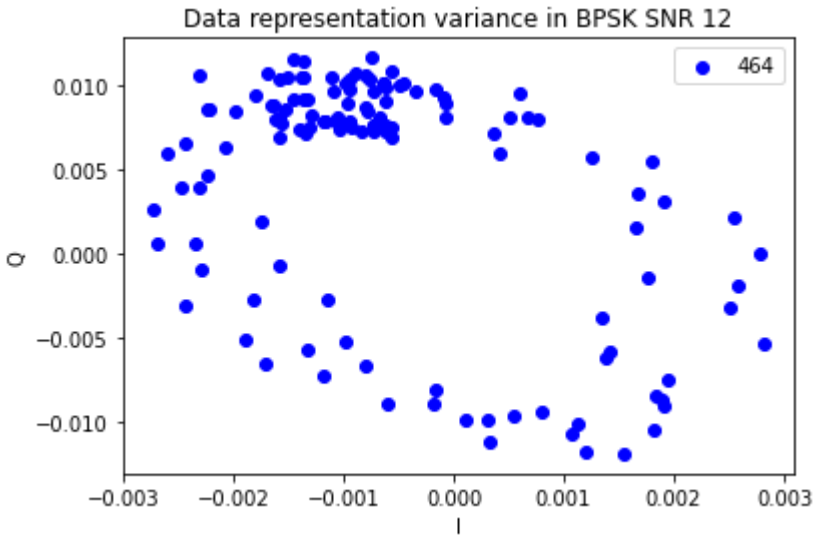
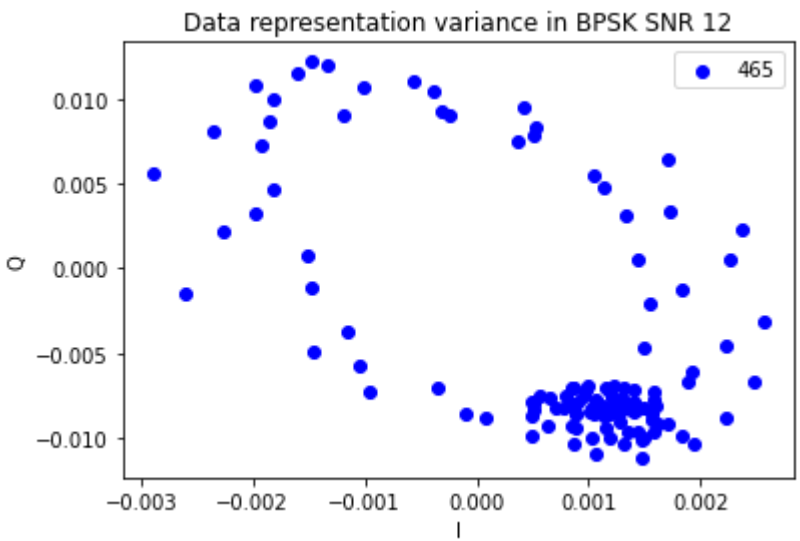
I


Data representation variance in BPSK SNR 12
464
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
465
0.010
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0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
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0.001
0.002
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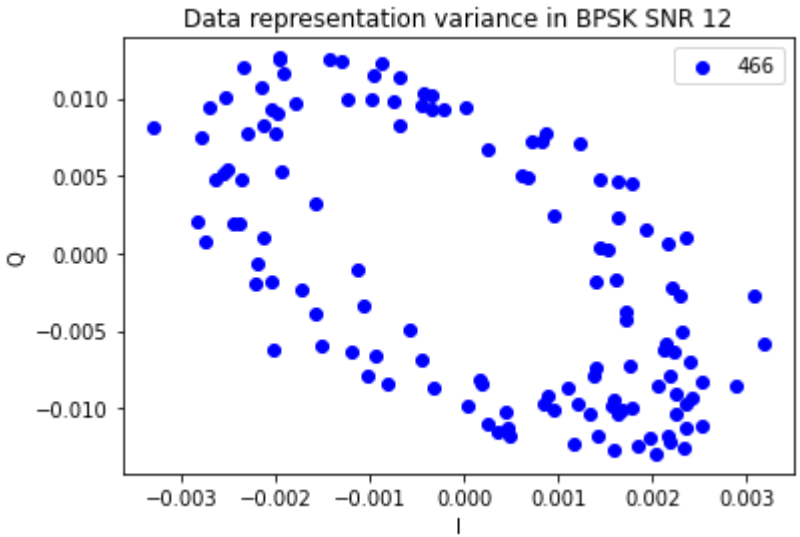
Data representation variance in BPSK SNR 12
466
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
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0.002
0.003
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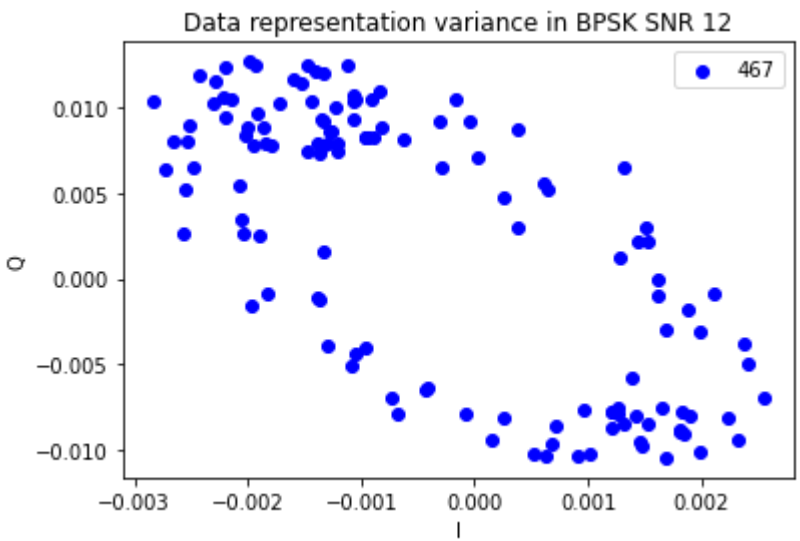
Data representation variance in BPSK SNR 12
467
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.002
−0.001
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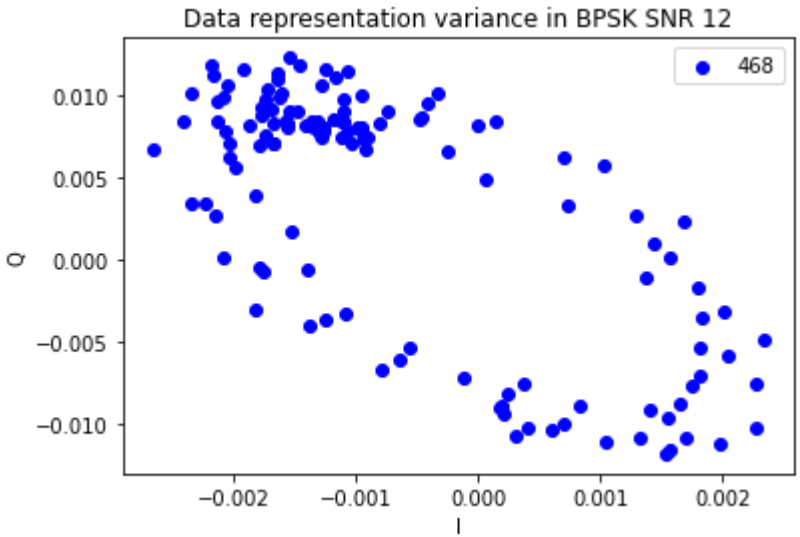
0.001
0.002
I


Data representation variance in BPSK SNR 12
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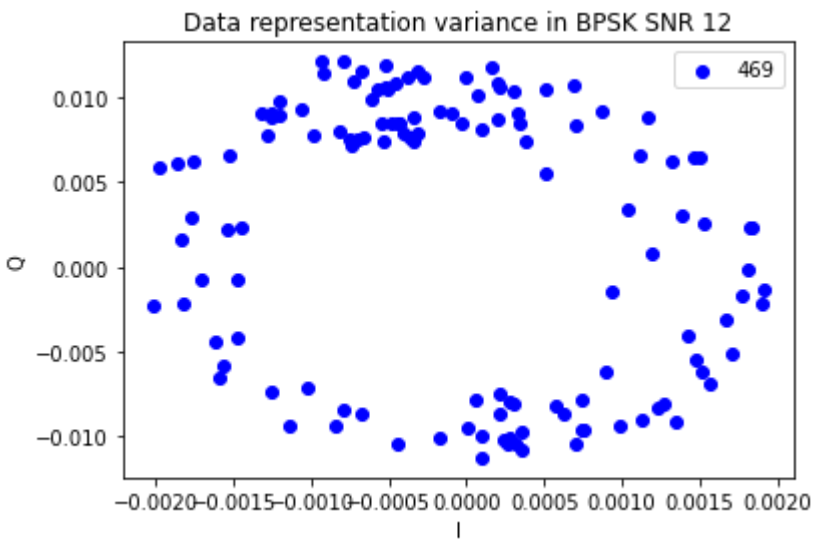
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
469
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.0015
−0.0010
−0.0005
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0.0005
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0.0015
0.0020
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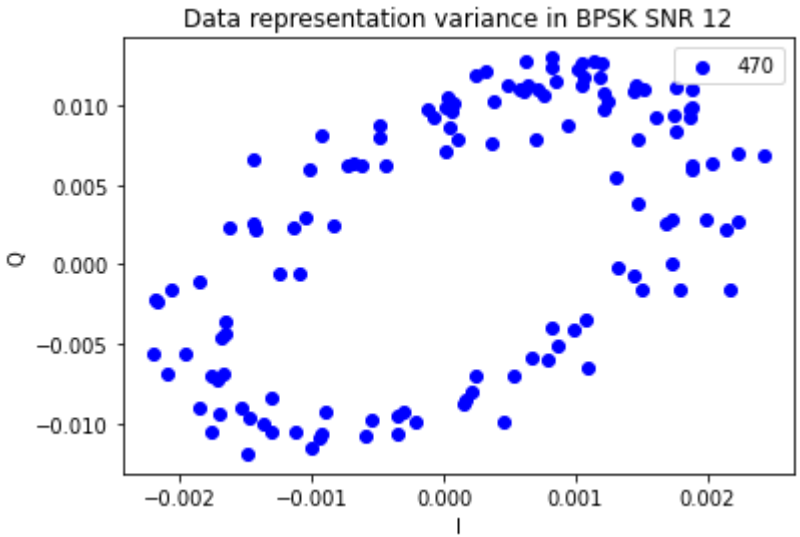
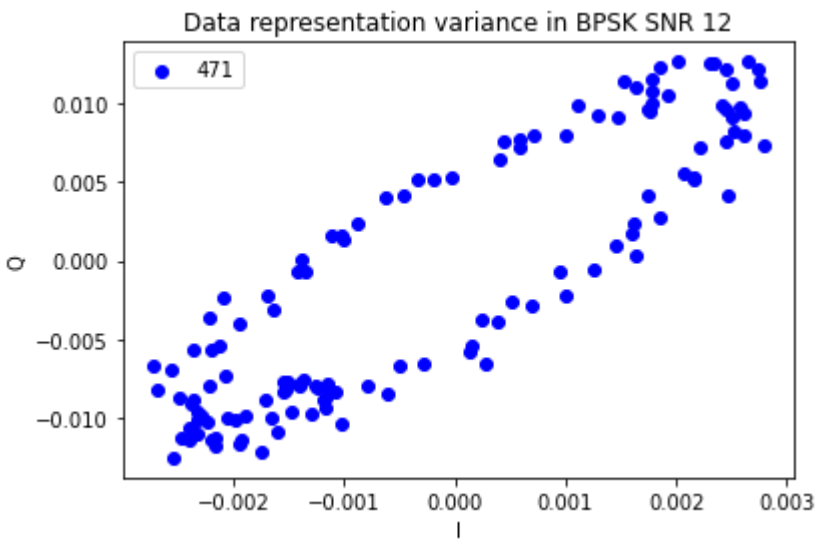
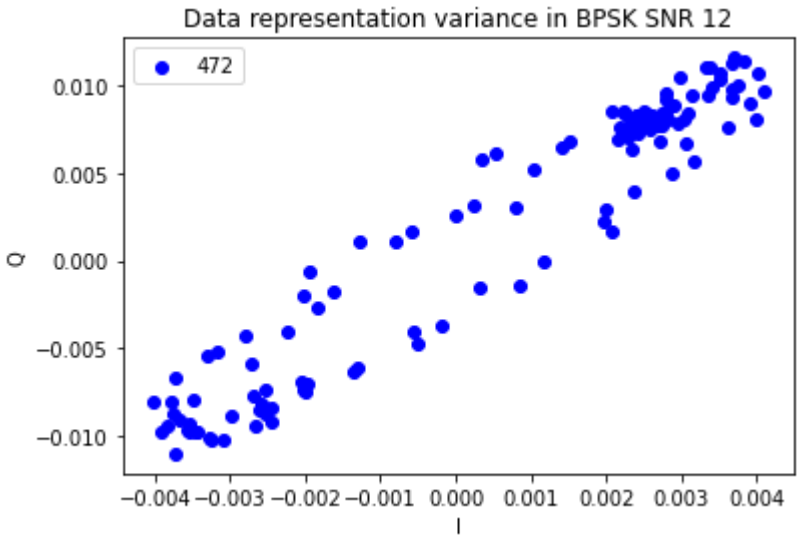
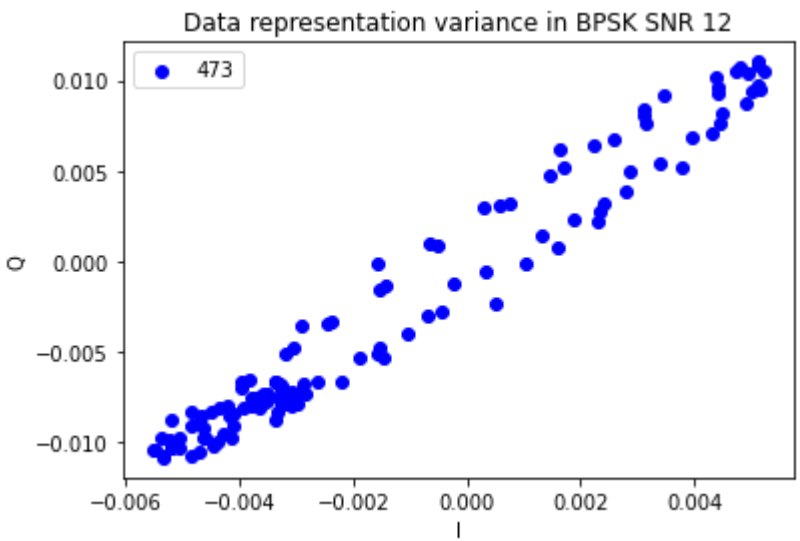
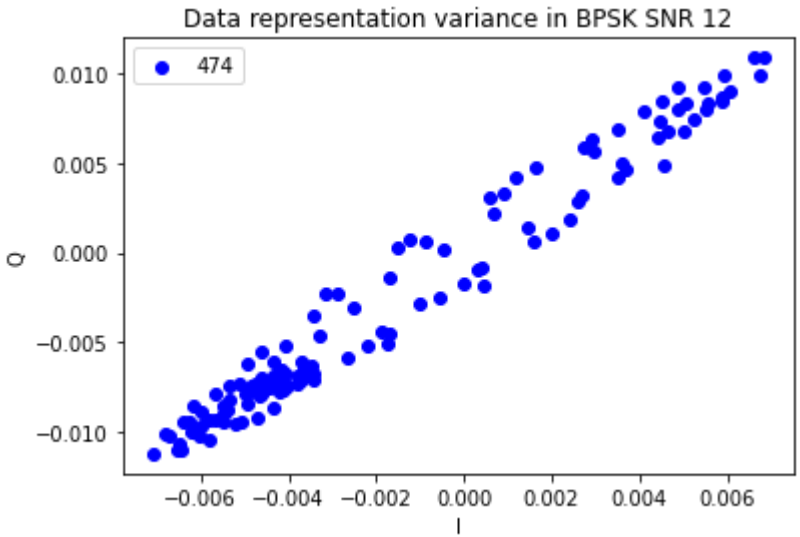
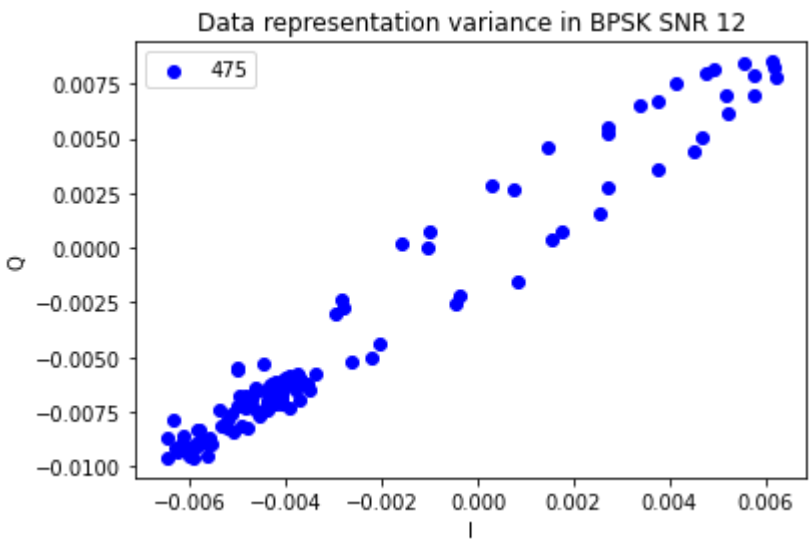

Data representation variance in BPSK SNR 12
470
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

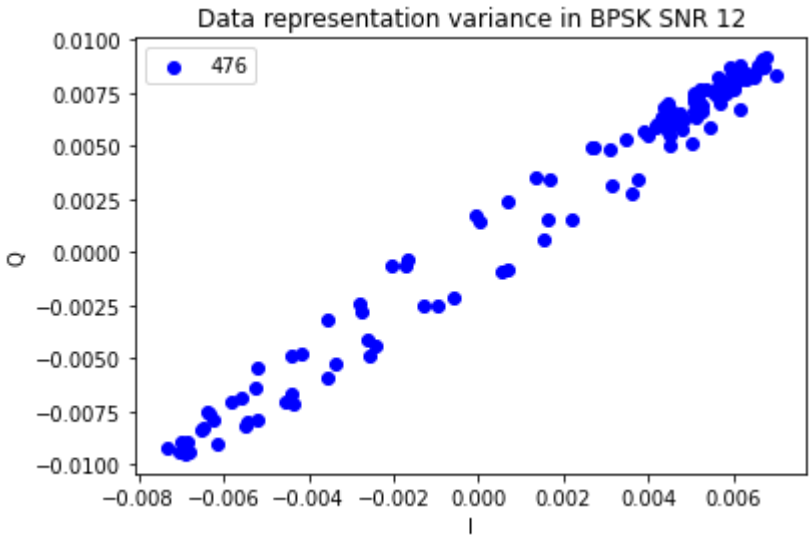

Data representation variance in BPSK SNR 12
471
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

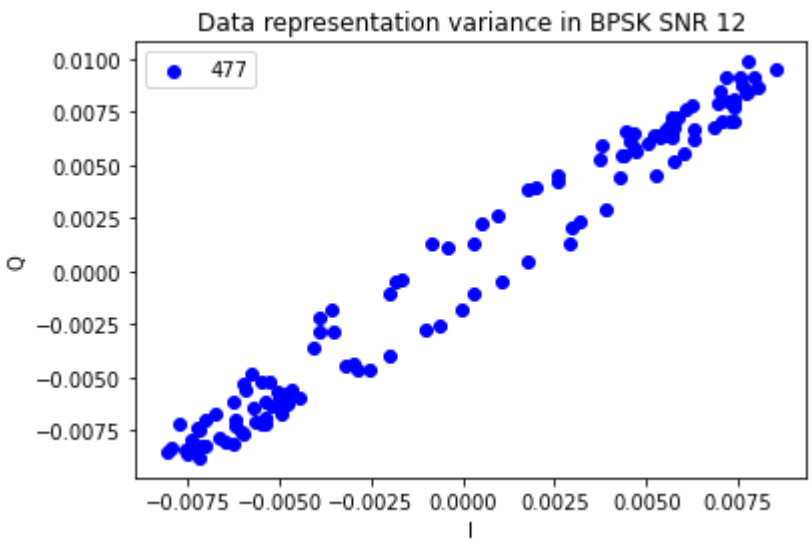

Data representation variance in BPSK SNR 12
472
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

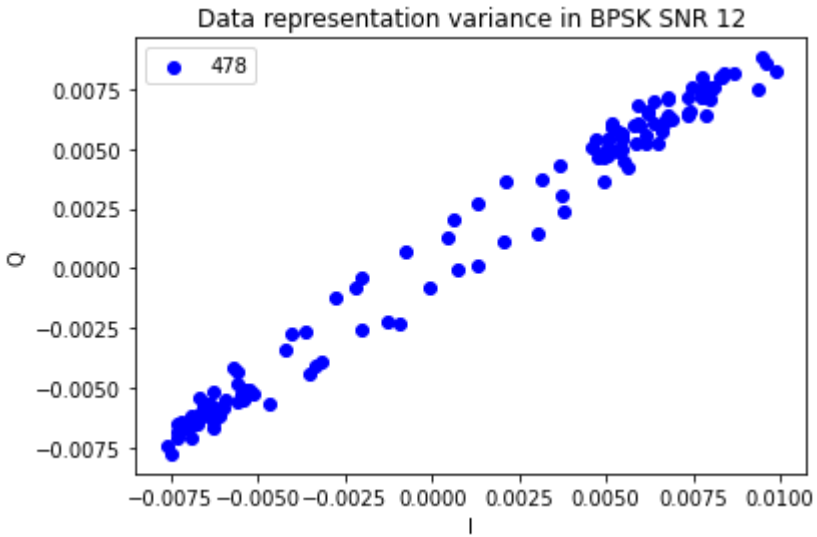

Data representation variance in BPSK SNR 12
473
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004
I

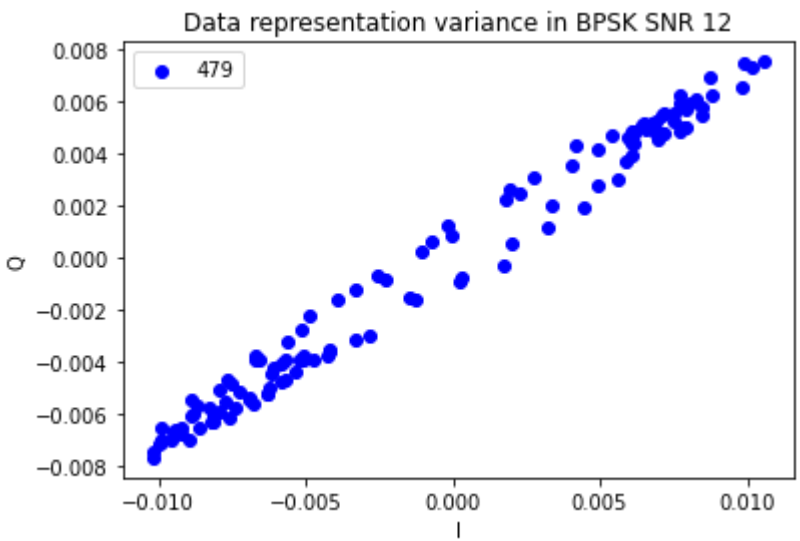

Data representation variance in BPSK SNR 12
474
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

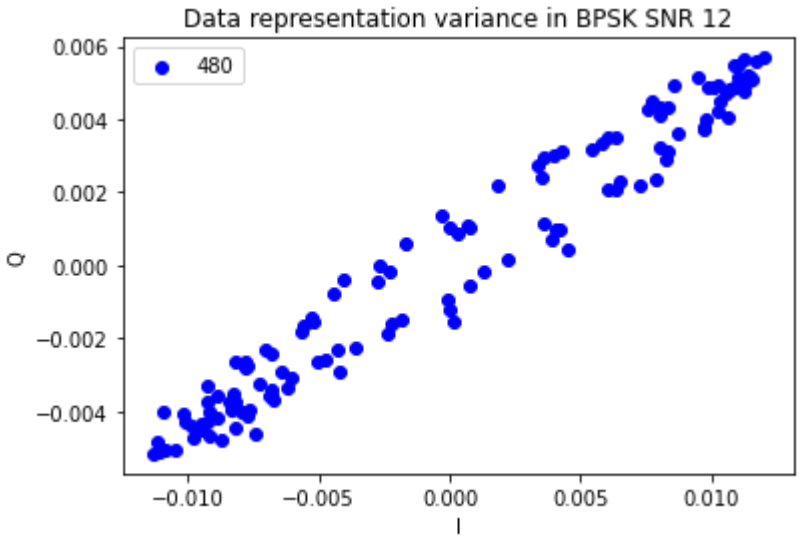

Data representation variance in BPSK SNR 12
475
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

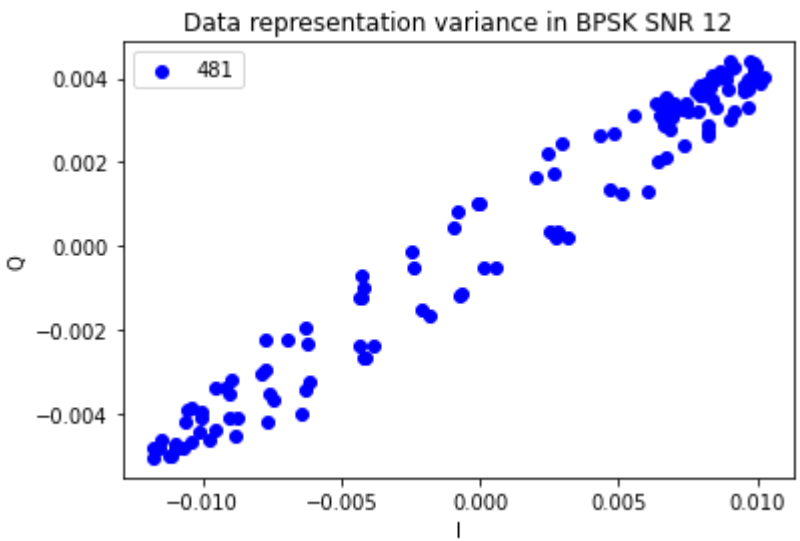

Data representation variance in BPSK SNR 12
476
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

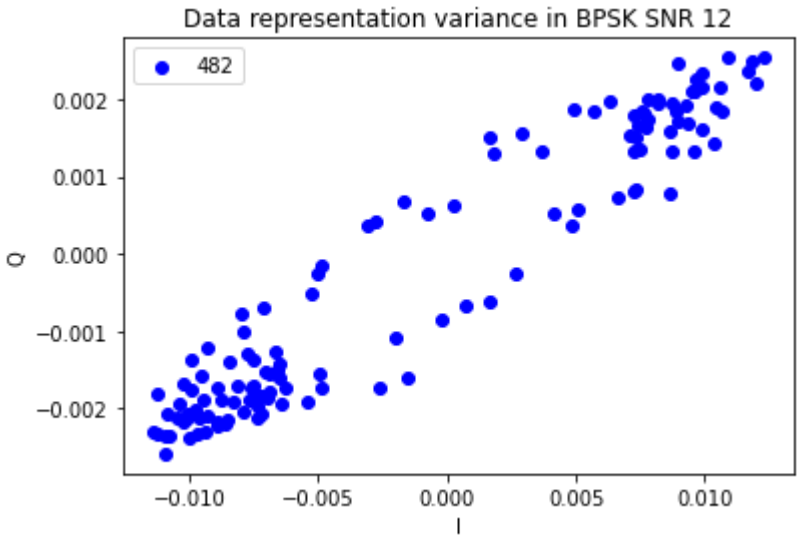

Data representation variance in BPSK SNR 12
477
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
I

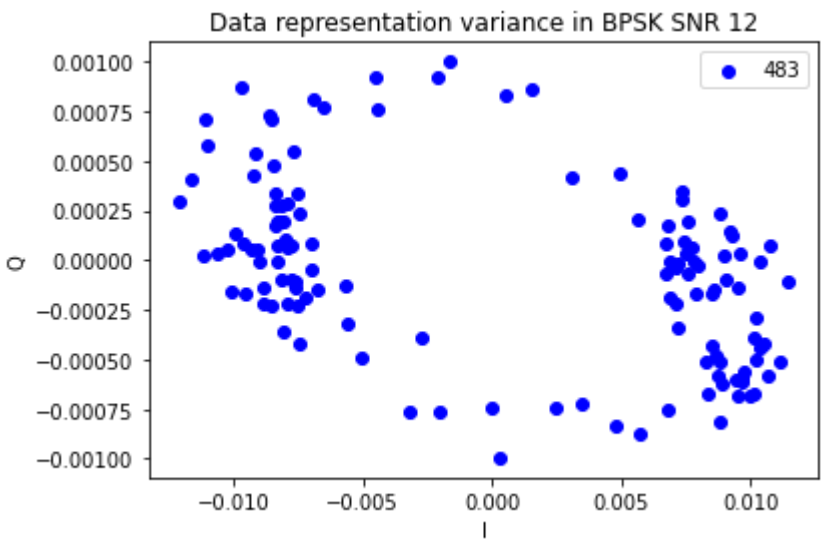

Data representation variance in BPSK SNR 12
478
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

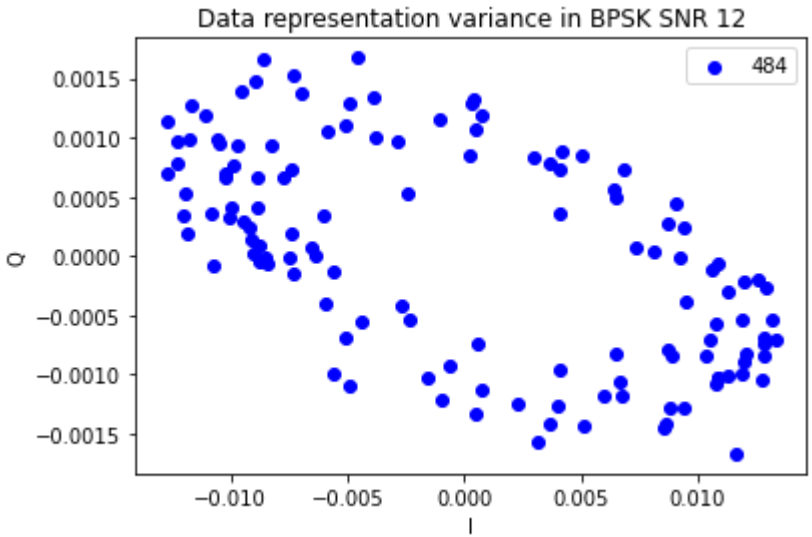

Data representation variance in BPSK SNR 12
479
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010 −0.005 0.000 0.005 0.010
I

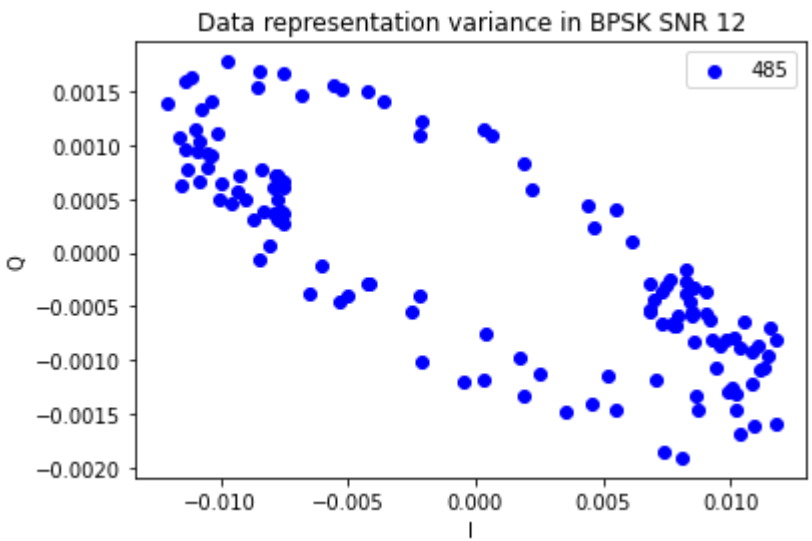

Data representation variance in BPSK SNR 12
480
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

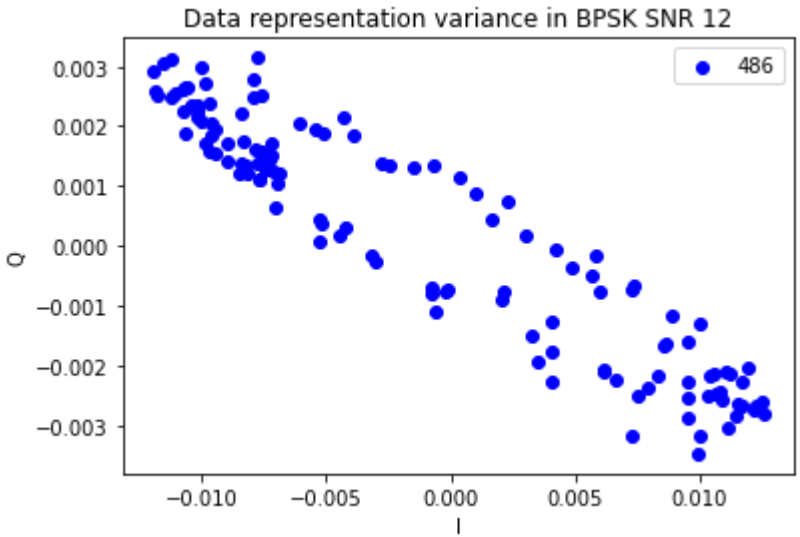

Data representation variance in BPSK SNR 12
481
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

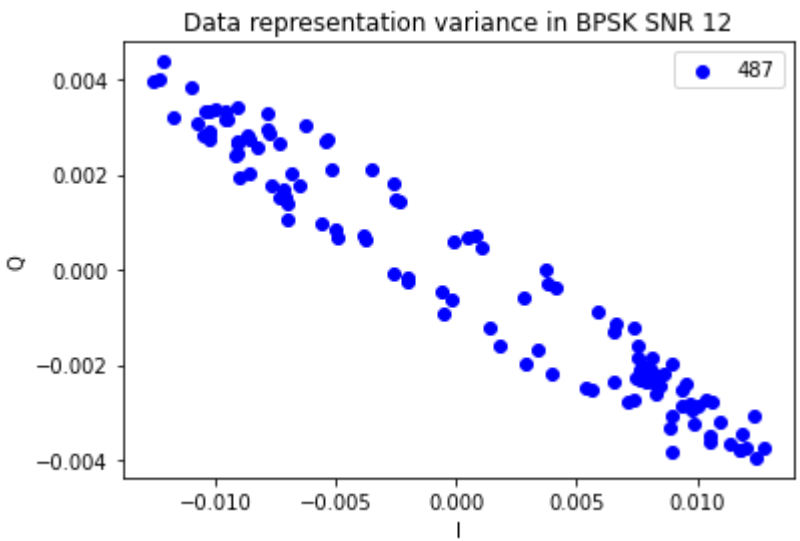

Data representation variance in BPSK SNR 12
482
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

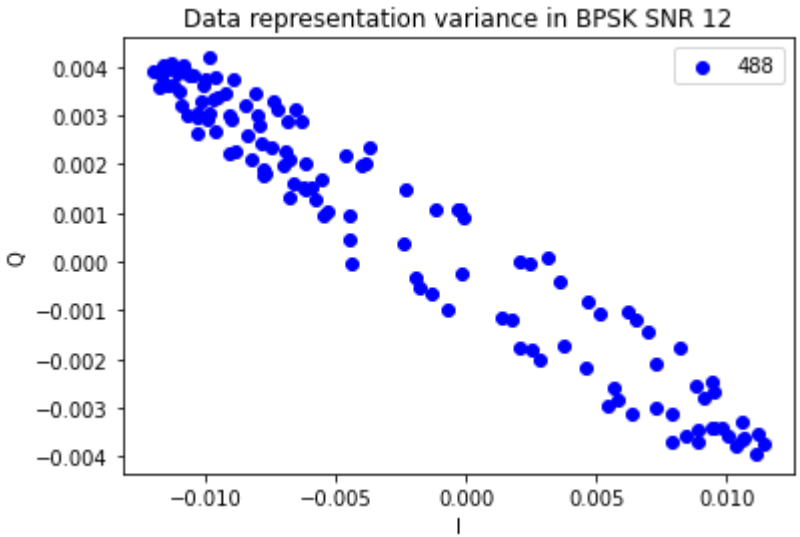

Data representation variance in BPSK SNR 12
483
0.00100
0.00075
0.00050
0.00025
0.00000
−0.00025
−0.00050
−0.00075
−0.00100
Q
−0.010
−0.005
0.000
0.005
0.010
I

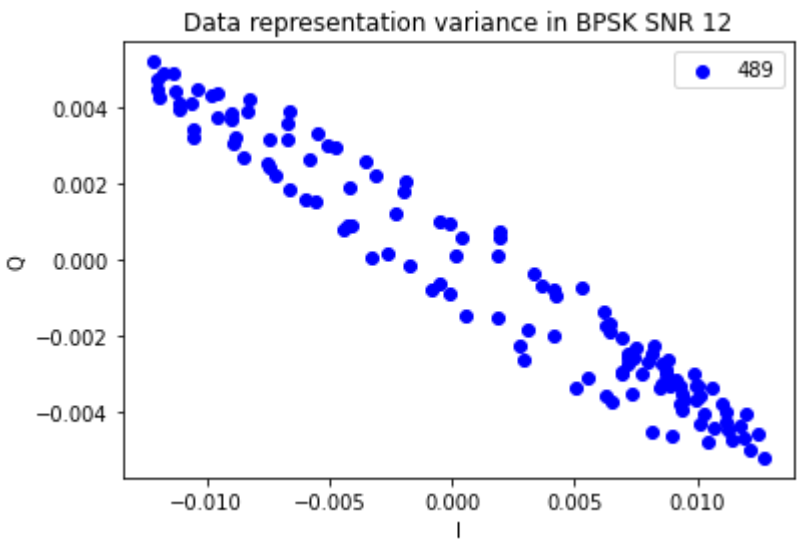

Data representation variance in BPSK SNR 12
484
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

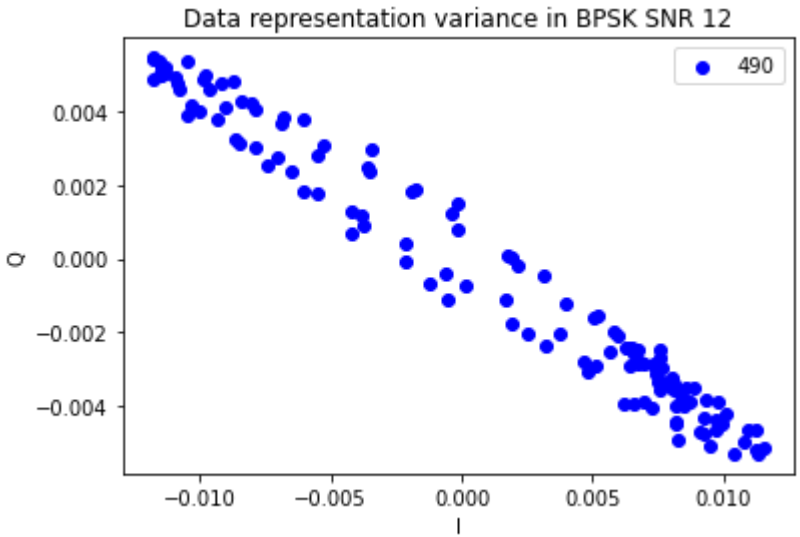

Data representation variance in BPSK SNR 12
485
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I

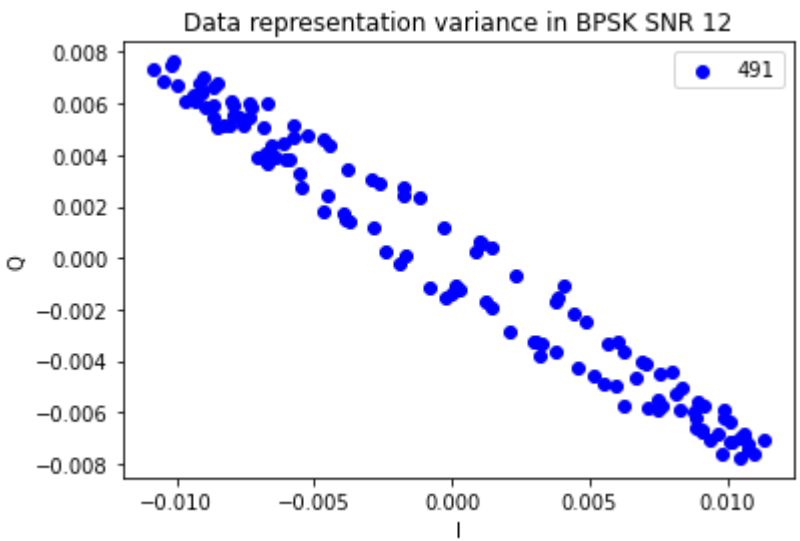

Data representation variance in BPSK SNR 12
486
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

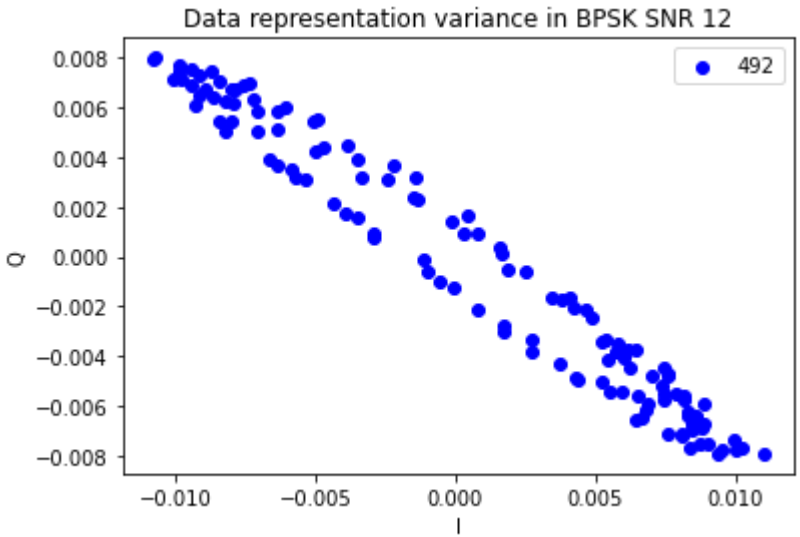

Data representation variance in BPSK SNR 12
487
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

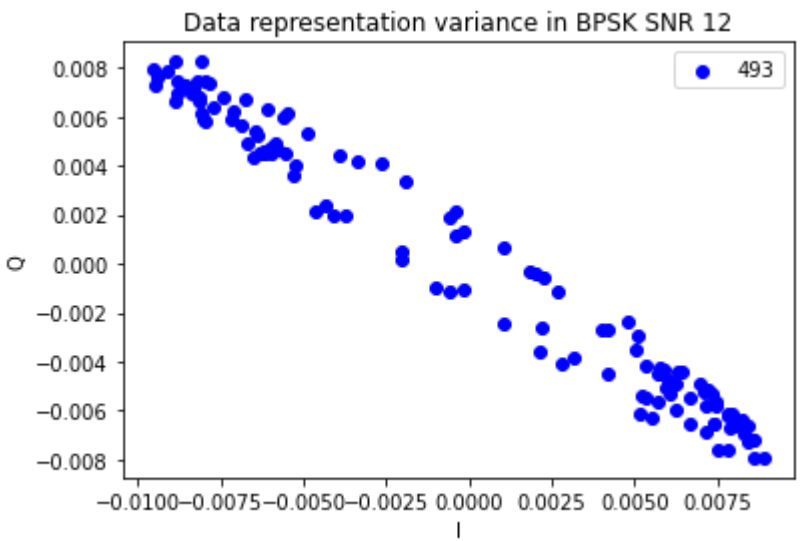

Data representation variance in BPSK SNR 12
488
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

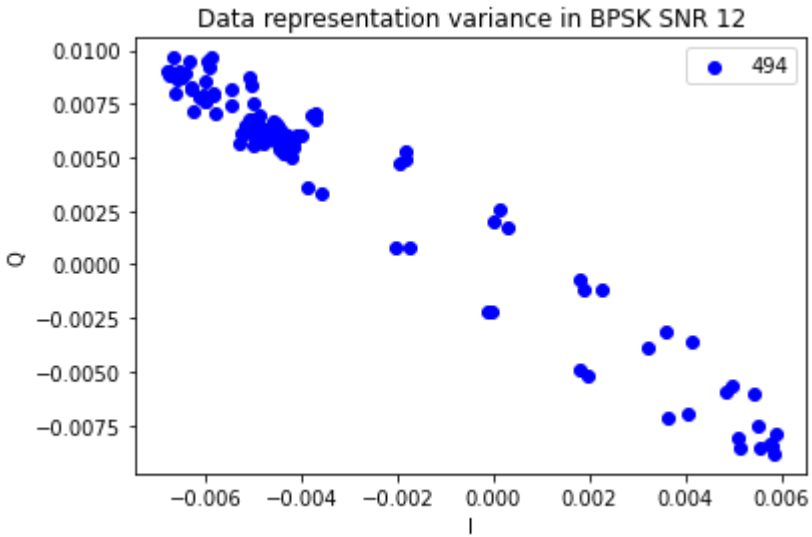

Data representation variance in BPSK SNR 12
489
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

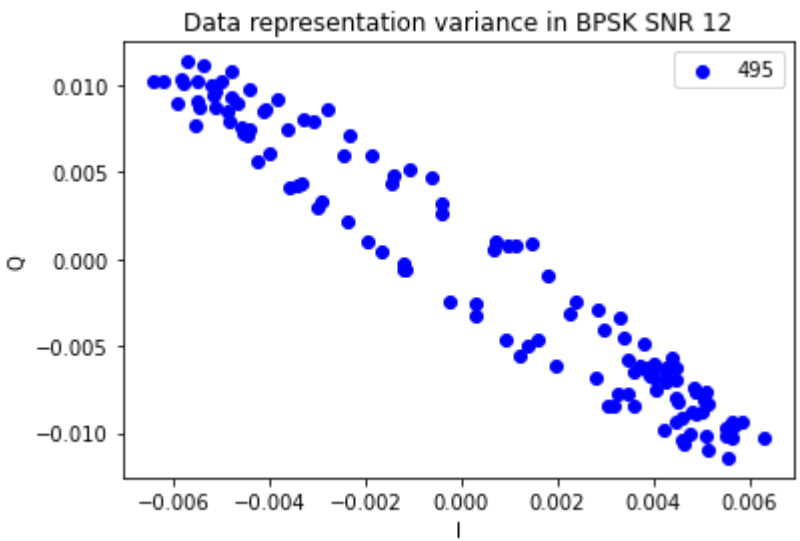

Data representation variance in BPSK SNR 12
490
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

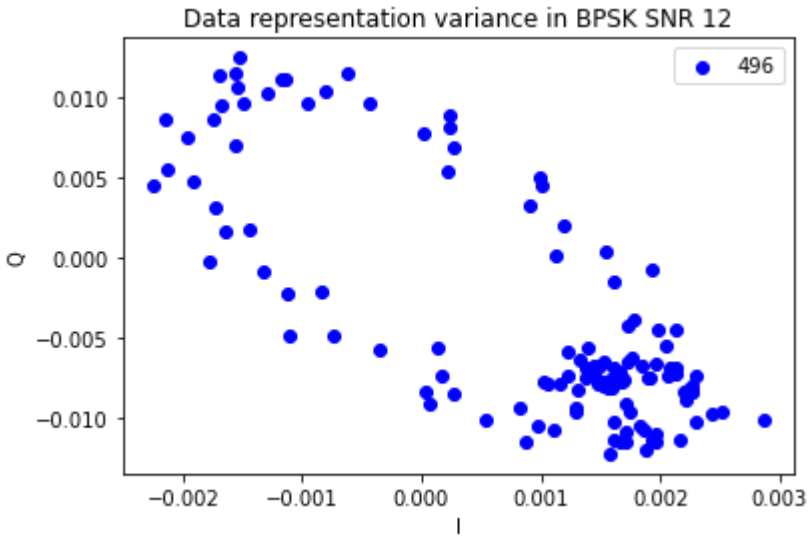

Data representation variance in BPSK SNR 12
491
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I

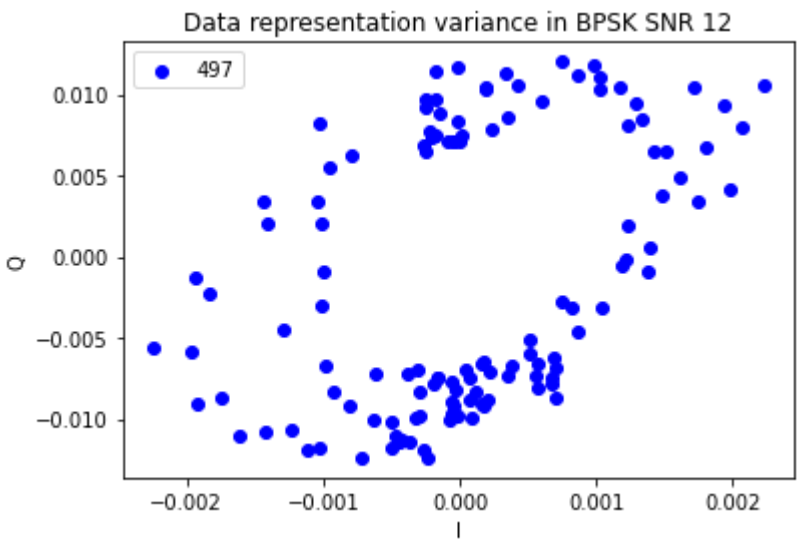

Data representation variance in BPSK SNR 12
492
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I

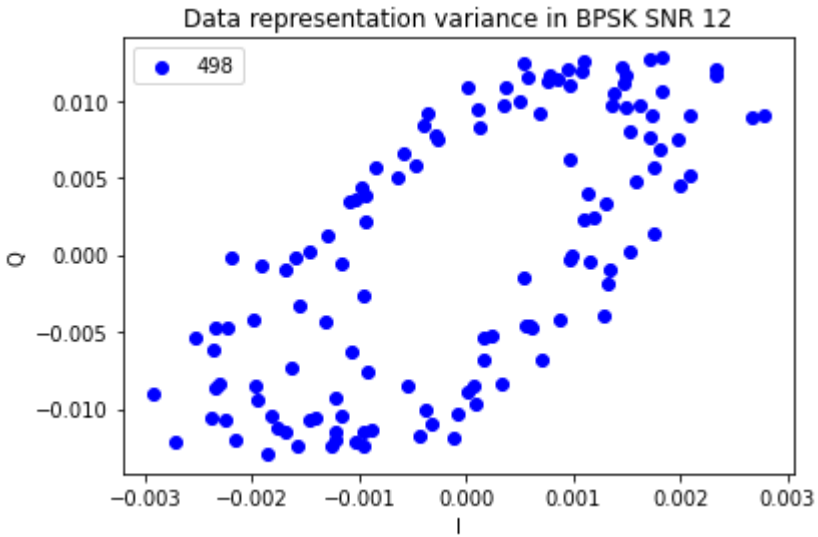

Data representation variance in BPSK SNR 12
493
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
I

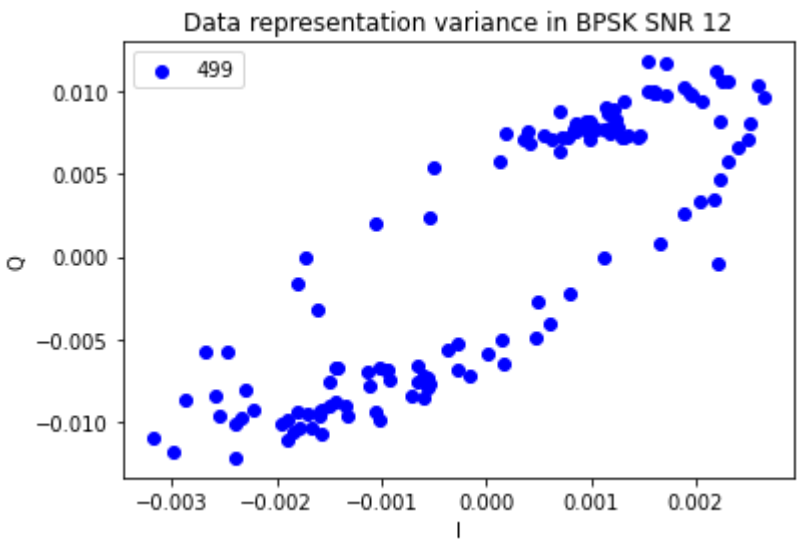

Data representation variance in BPSK SNR 12
494
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

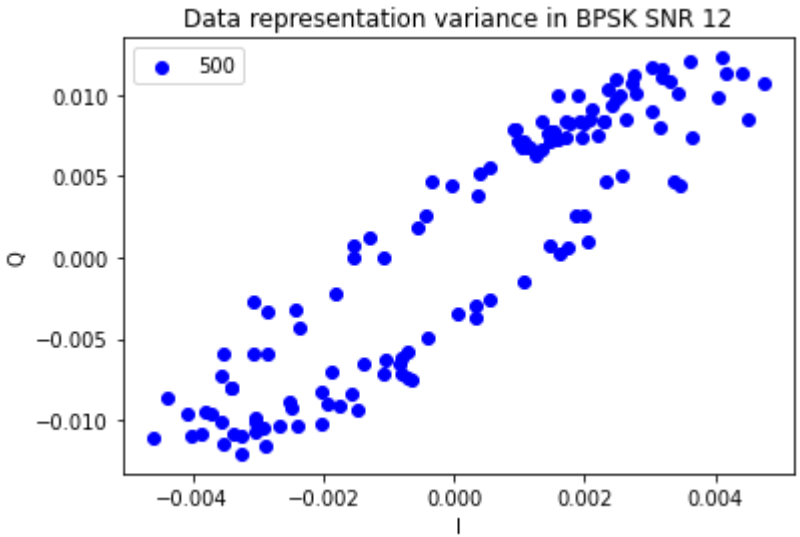

Data representation variance in BPSK SNR 12
495
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
496
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
497
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
498
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
499
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
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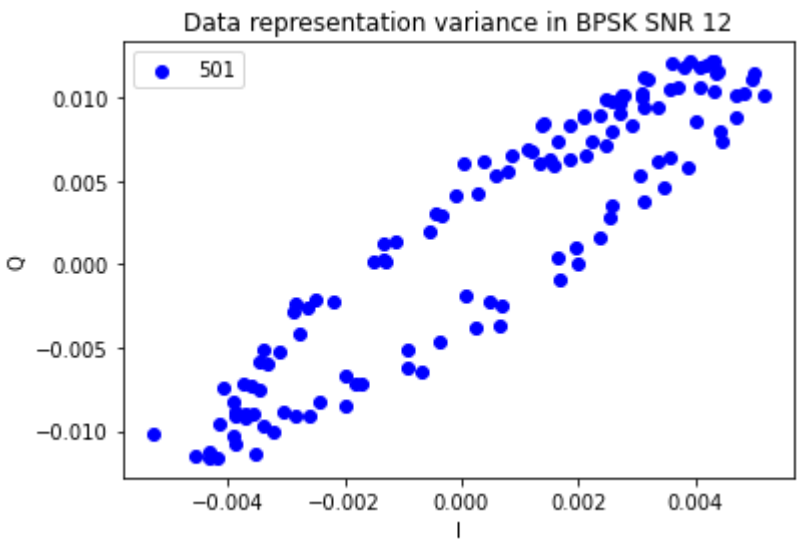
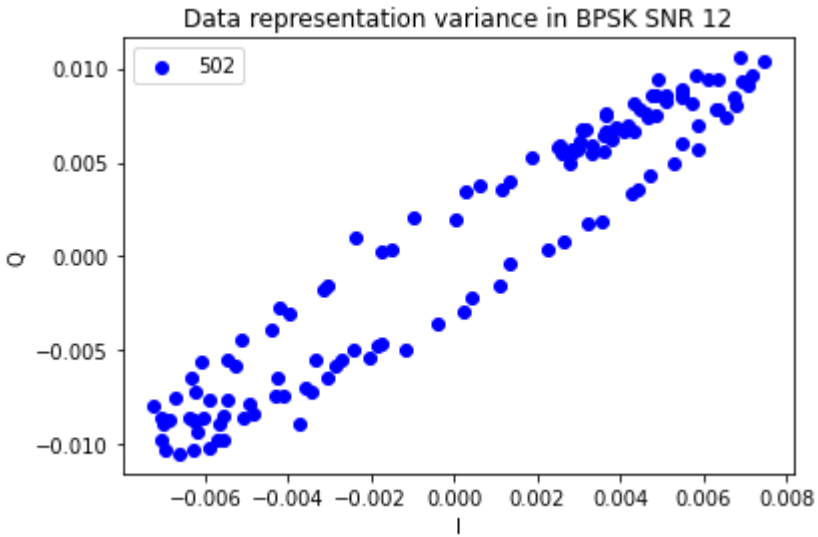
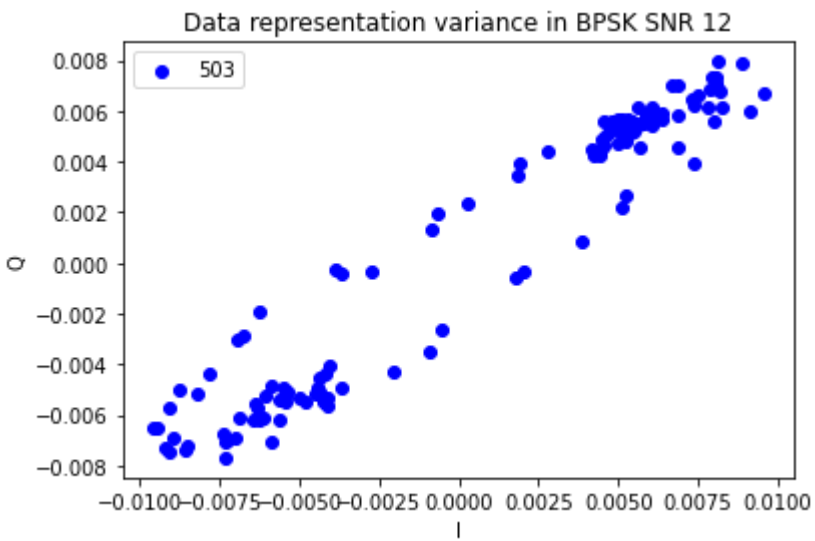
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
501
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
502
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
503
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
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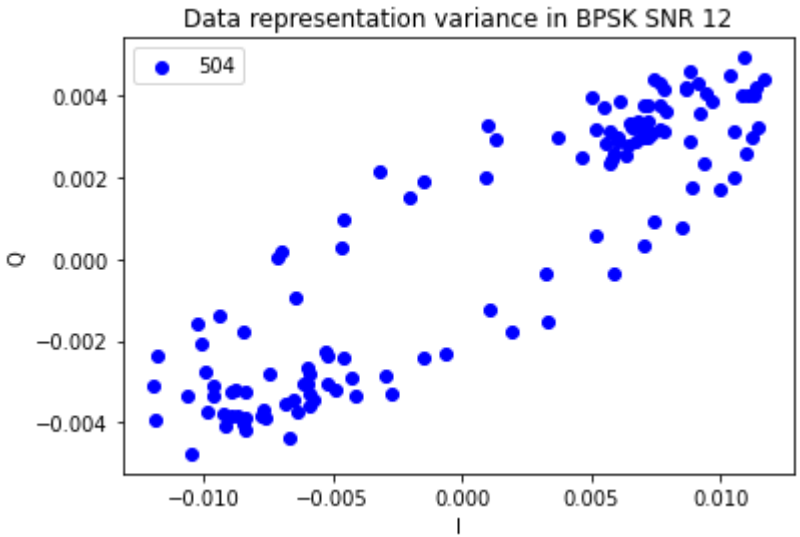
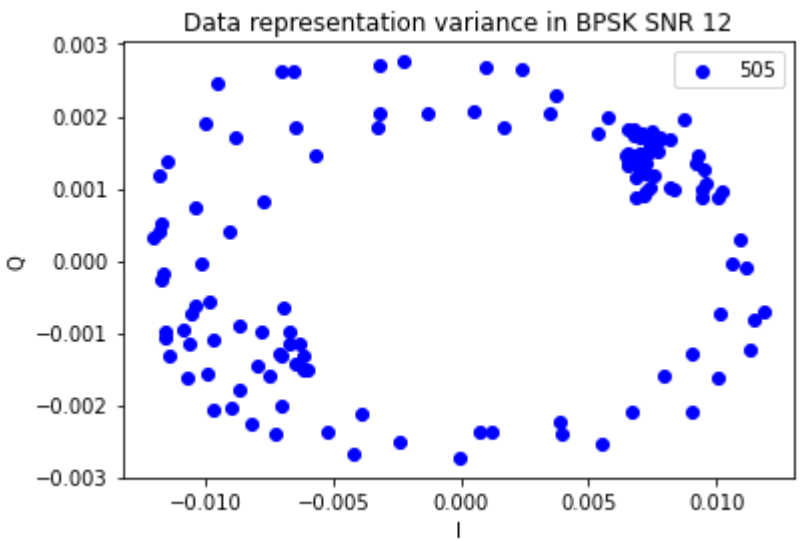
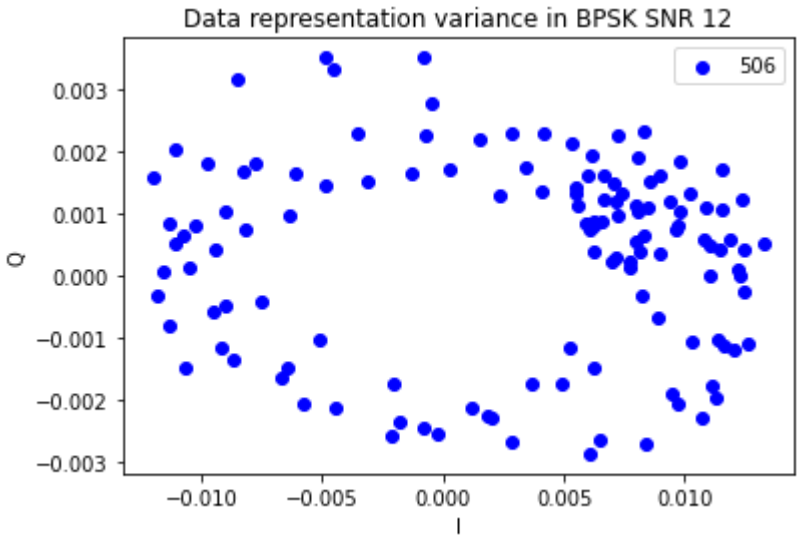
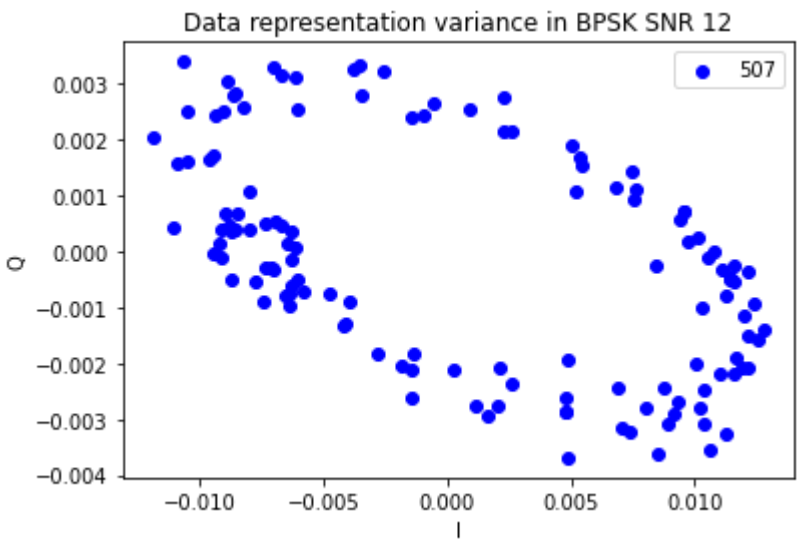
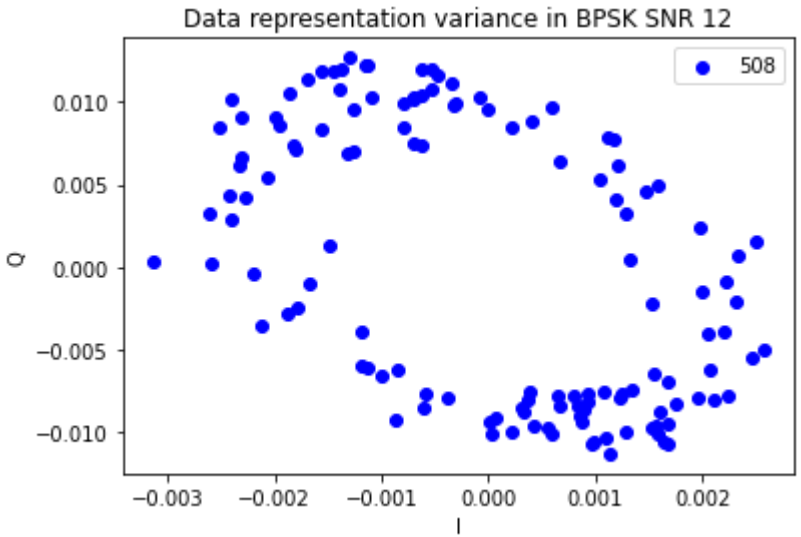
I

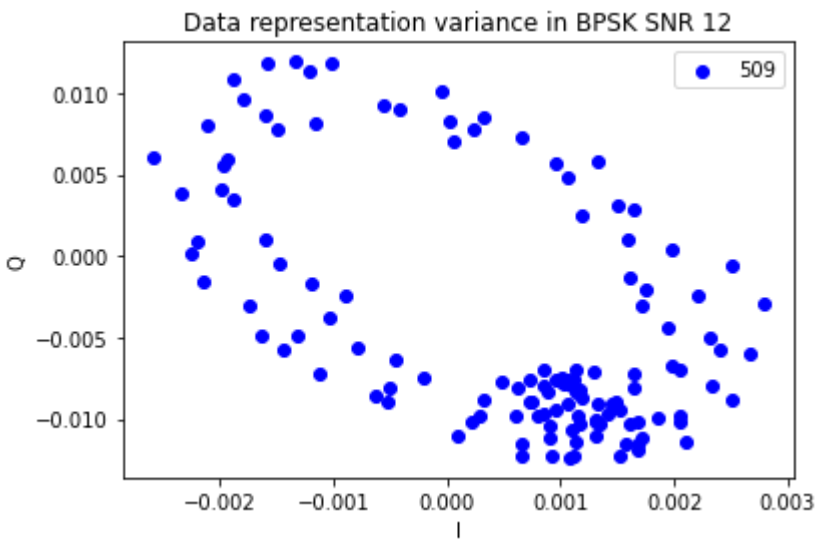

Data representation variance in BPSK SNR 12
504
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

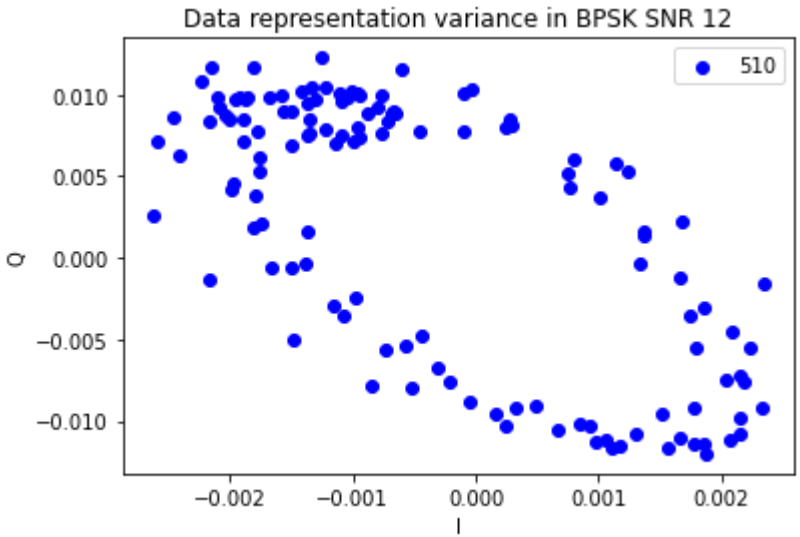

Data representation variance in BPSK SNR 12
505
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
506
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
507
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
508
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
509
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
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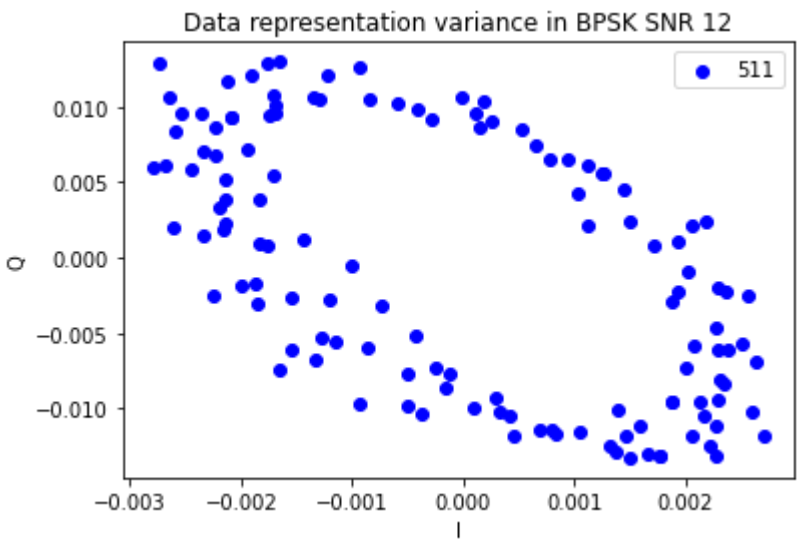
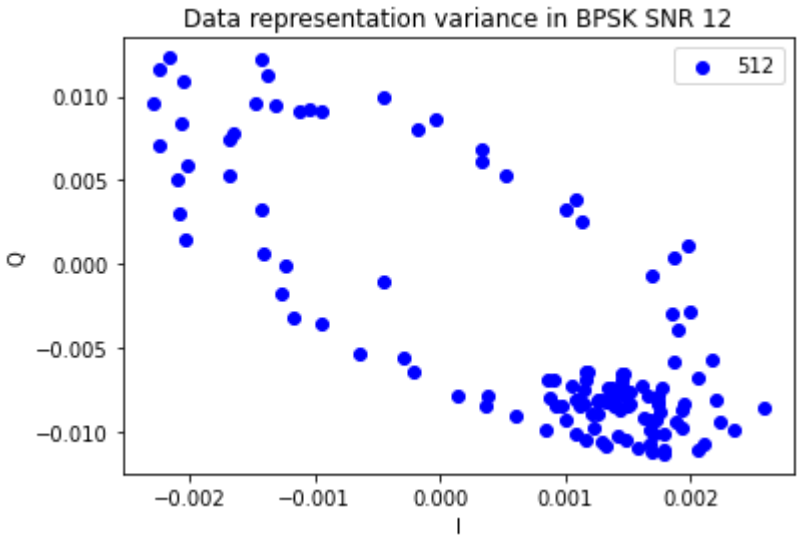
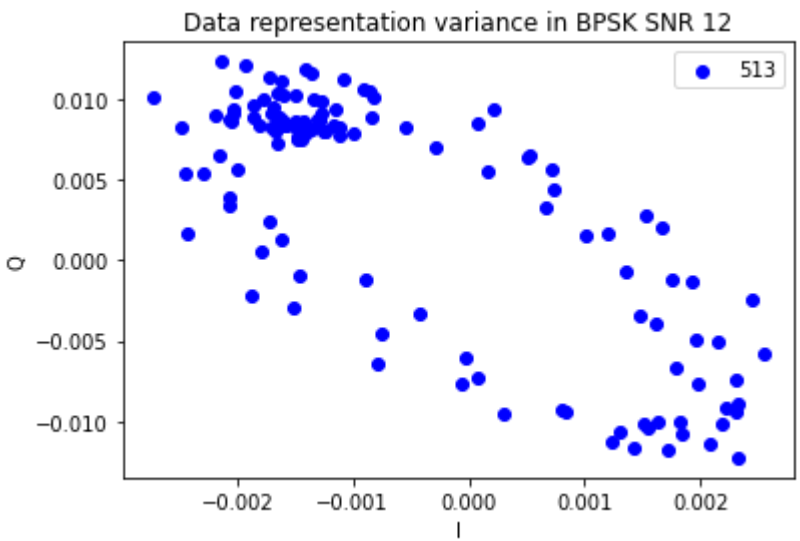
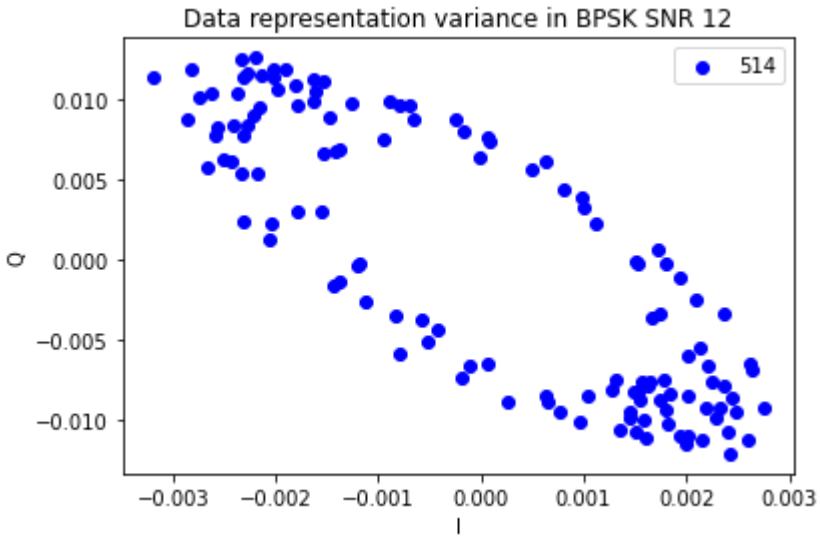
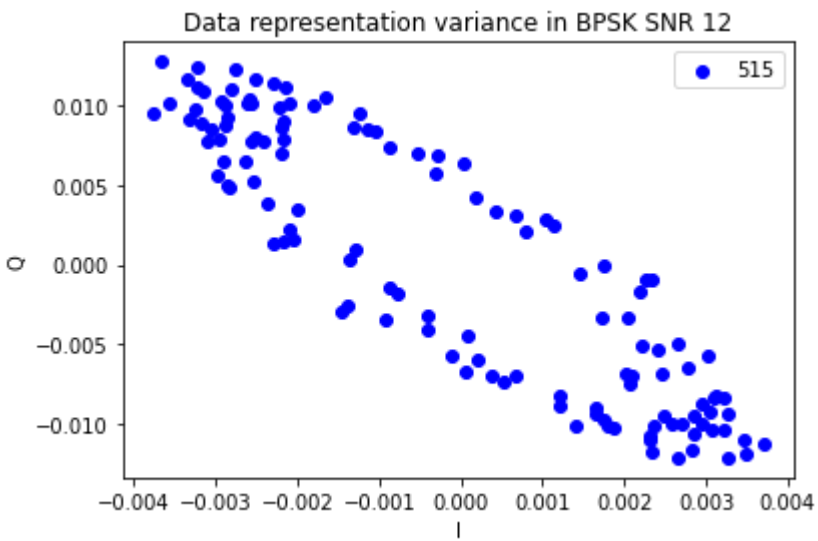
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

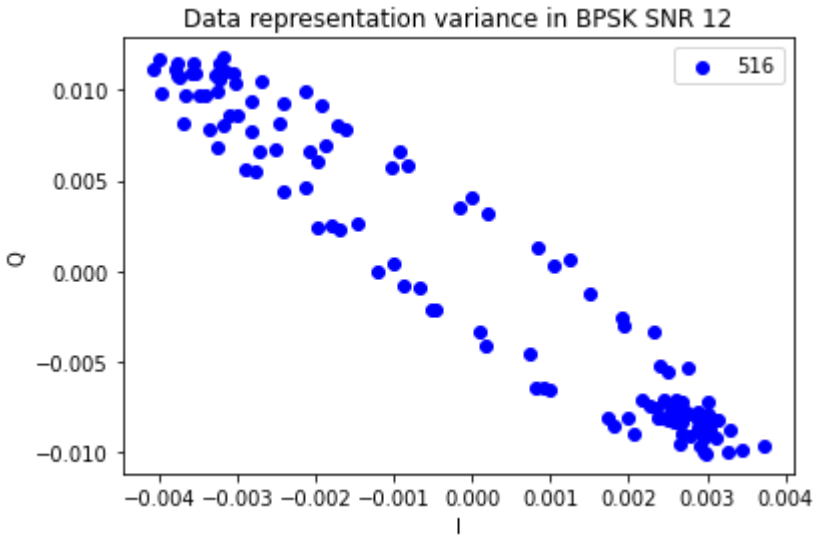

Data representation variance in BPSK SNR 12
511
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

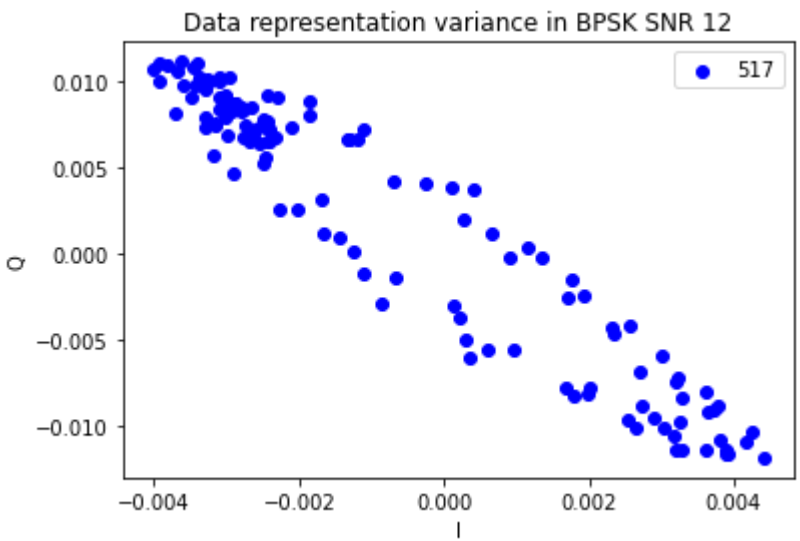

Data representation variance in BPSK SNR 12
512
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
513
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
514
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
515
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I


Data representation variance in BPSK SNR 12
516
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
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−0.010
Q
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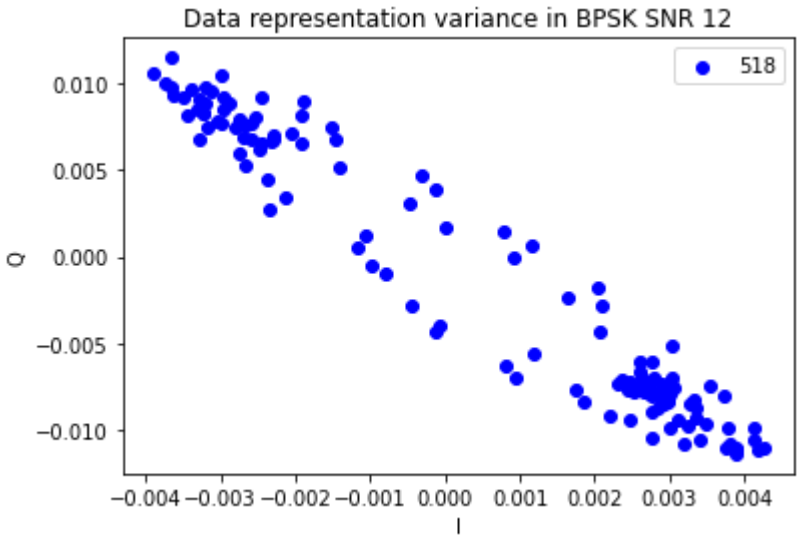
Data representation variance in BPSK SNR 12
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0.010
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−0.010
Q
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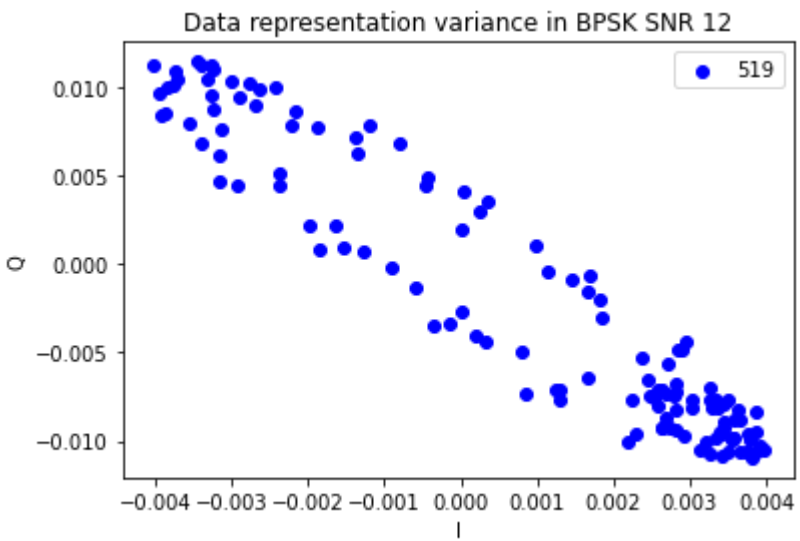
Data representation variance in BPSK SNR 12
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−0.010
Q
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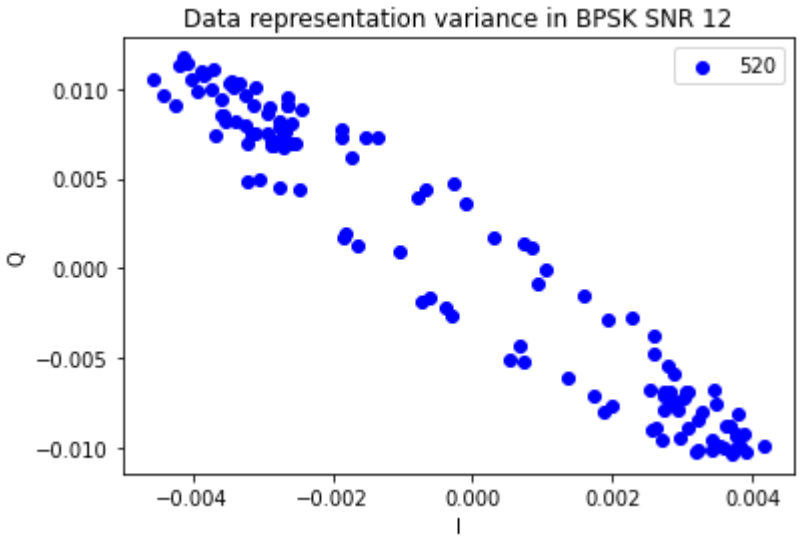
Data representation variance in BPSK SNR 12
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Q
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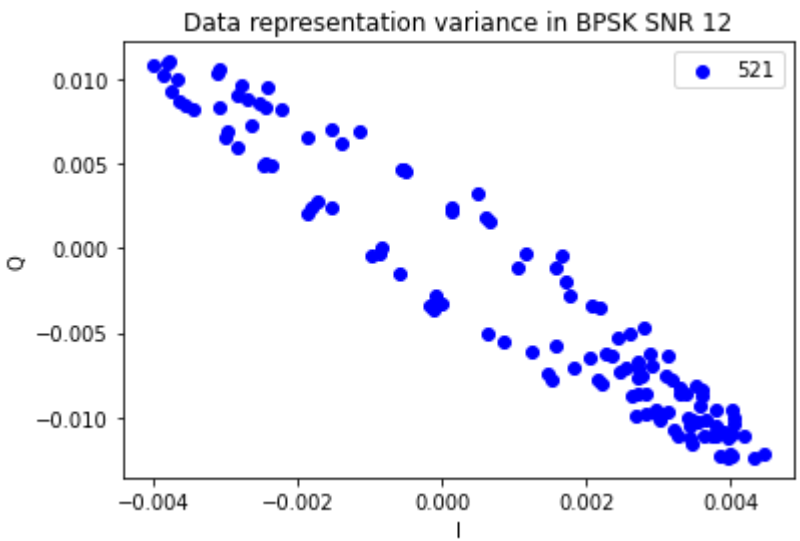
Data representation variance in BPSK SNR 12
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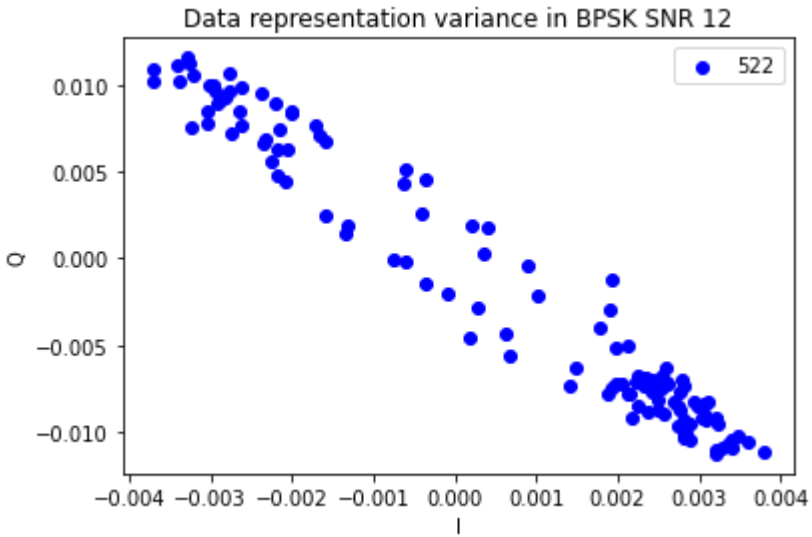
Data representation variance in BPSK SNR 12
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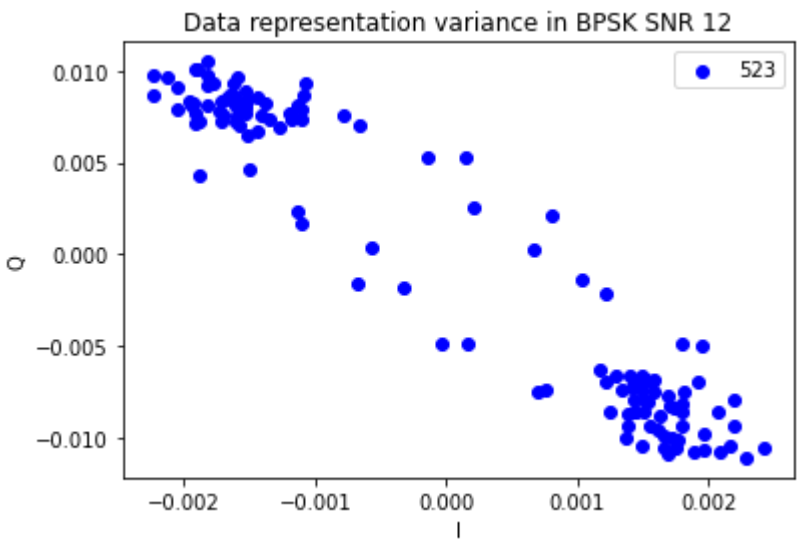
Data representation variance in BPSK SNR 12
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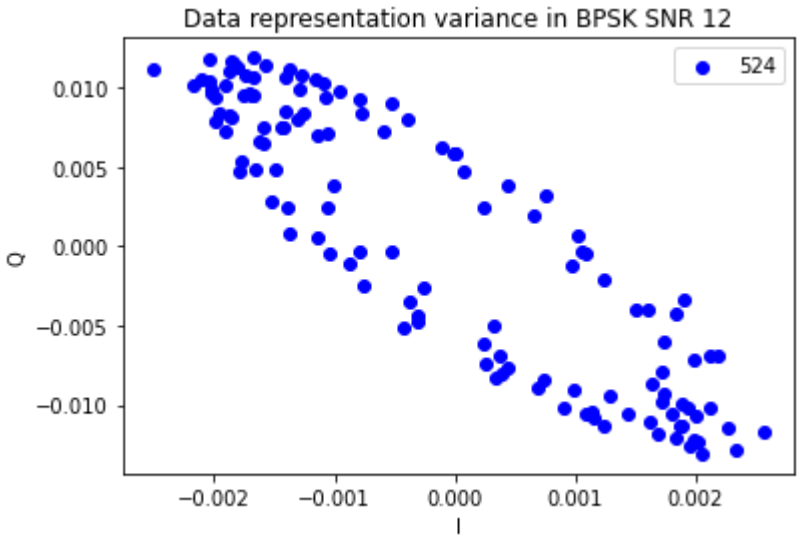
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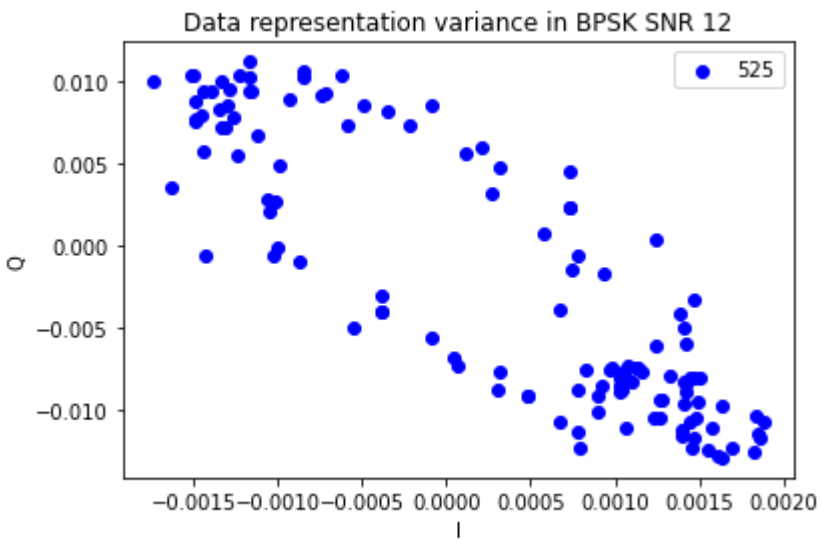
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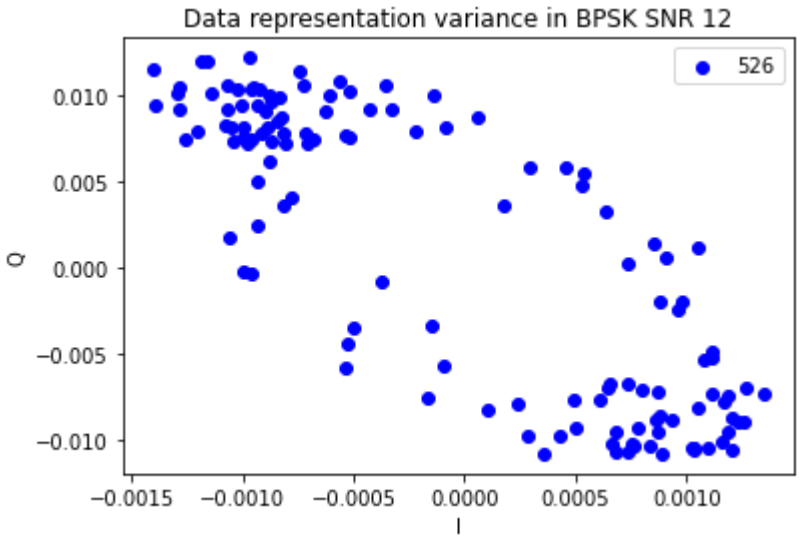
Data representation variance in BPSK SNR 12
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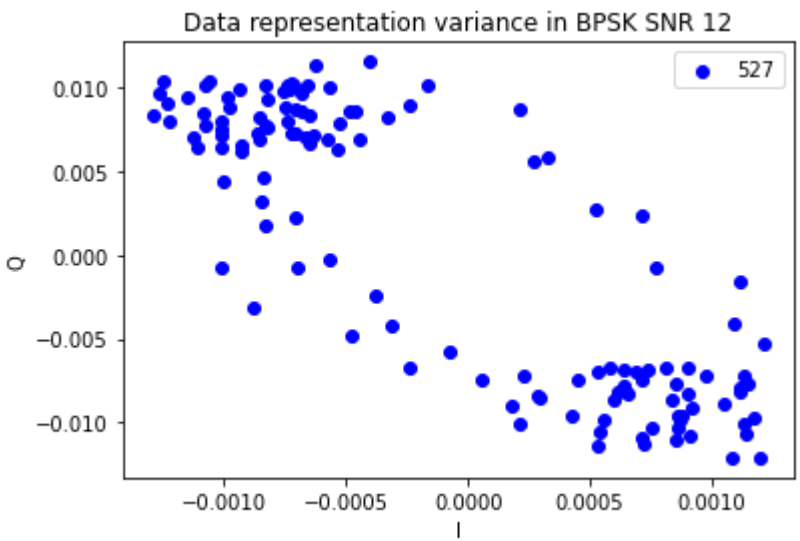
Data representation variance in BPSK SNR 12
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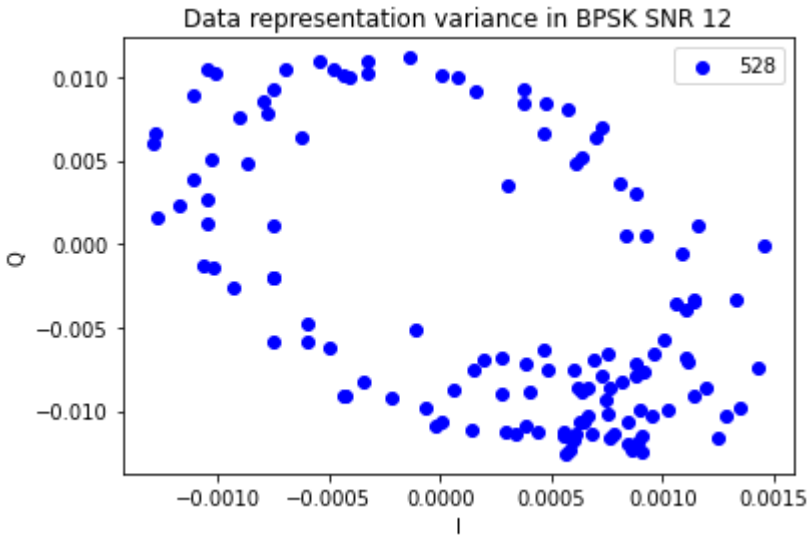
Data representation variance in BPSK SNR 12
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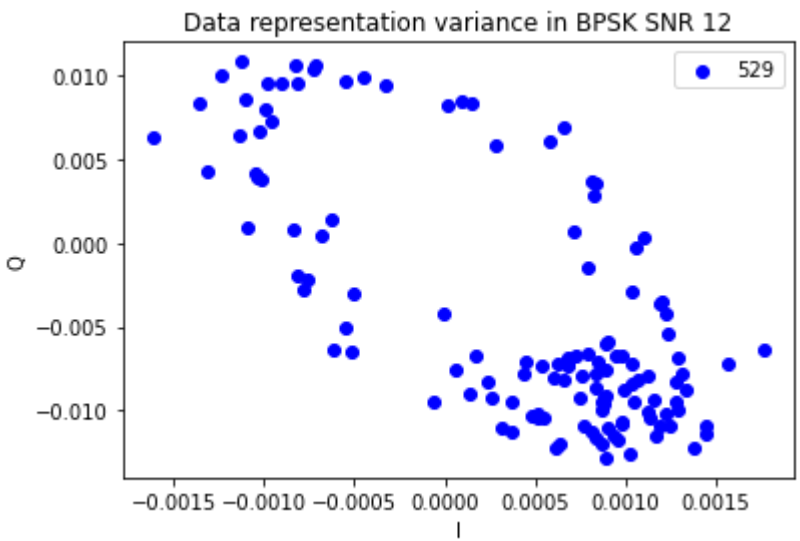
Data representation variance in BPSK SNR 12
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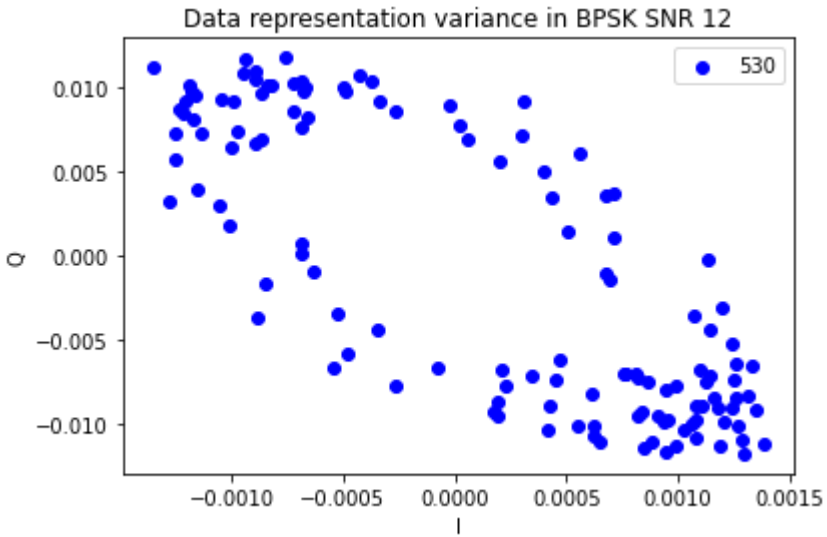
Data representation variance in BPSK SNR 12
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−0.010
Q
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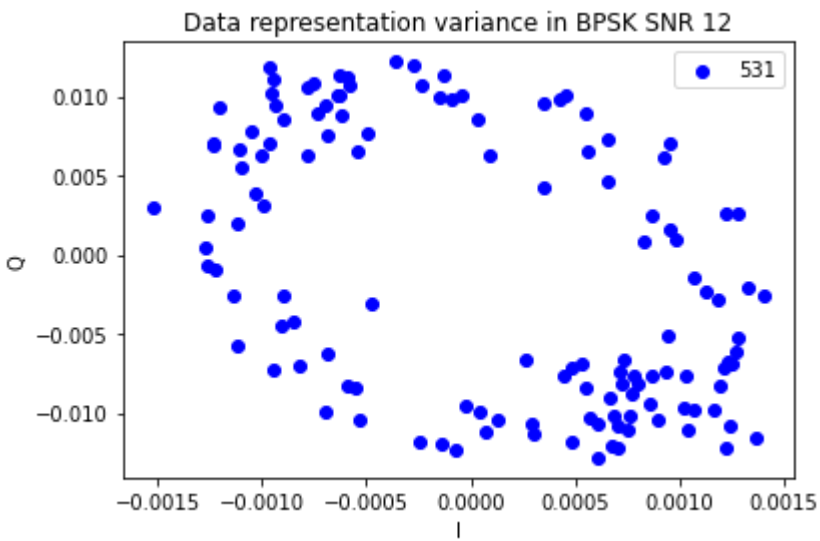
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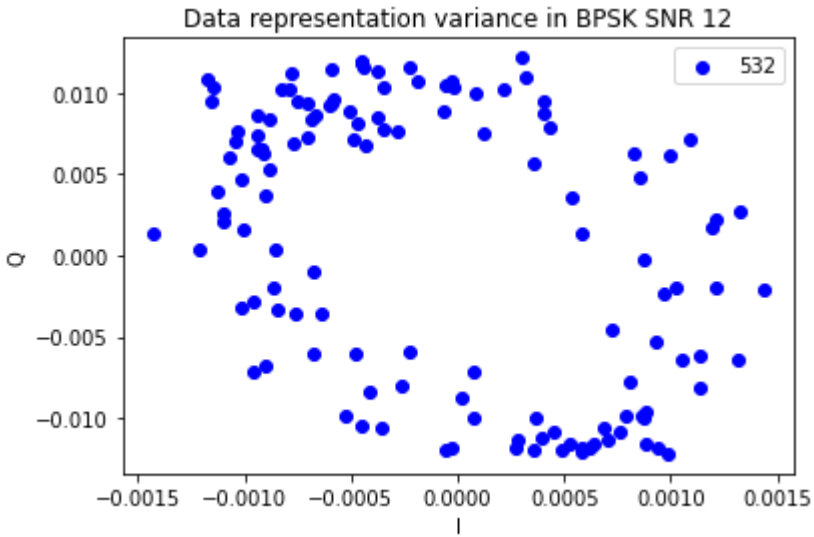
Data representation variance in BPSK SNR 12
532
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.0010
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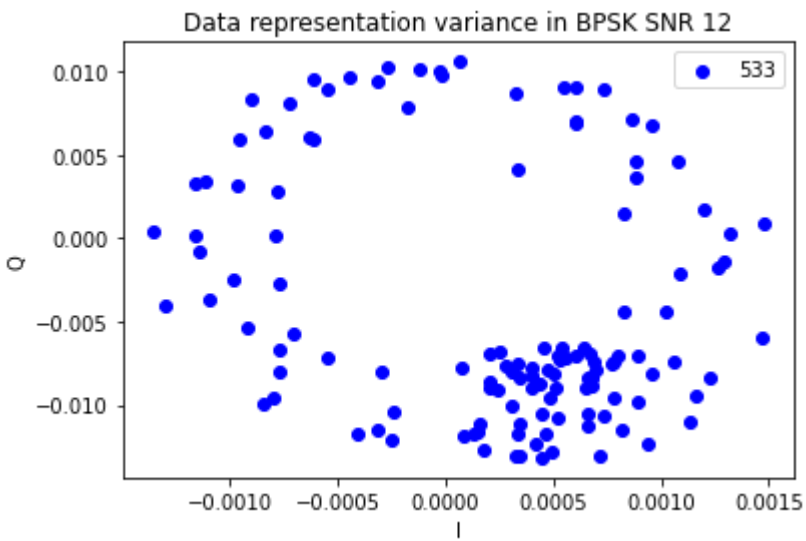
Data representation variance in BPSK SNR 12
533
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−0.010
Q
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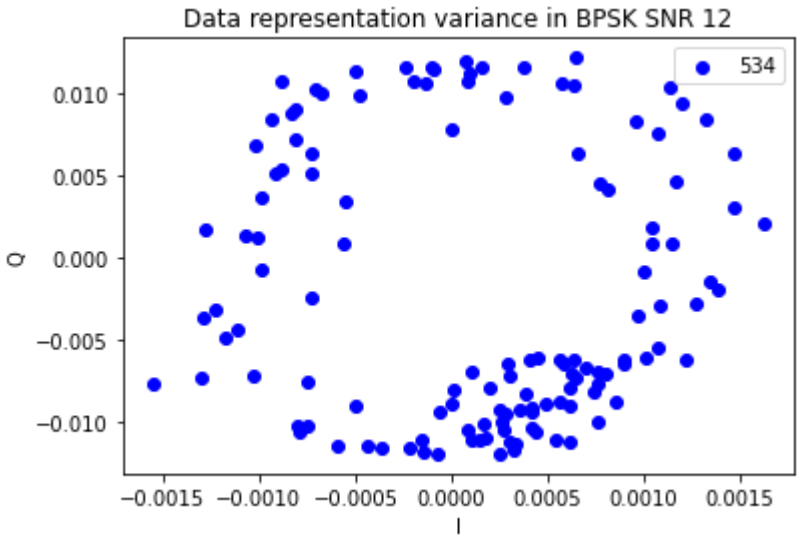
Data representation variance in BPSK SNR 12
534
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0.005
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Q
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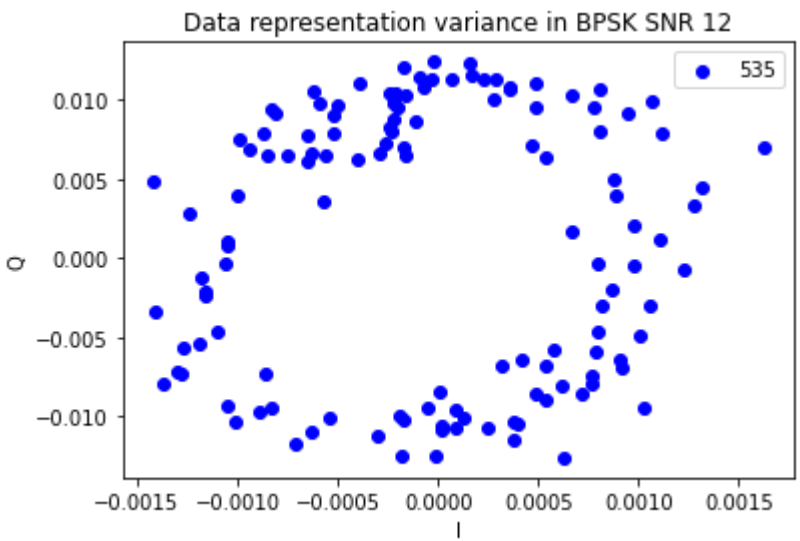
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−0.005
−0.010
Q
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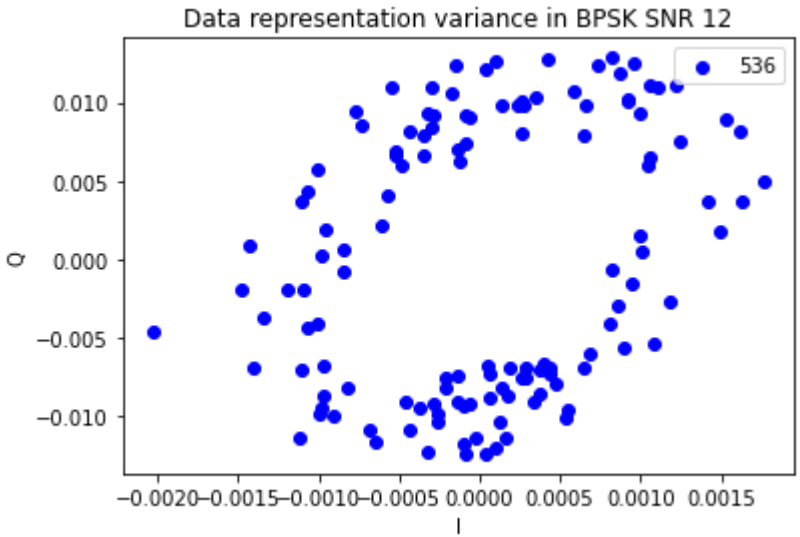
Data representation variance in BPSK SNR 12
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−0.005
−0.010
Q
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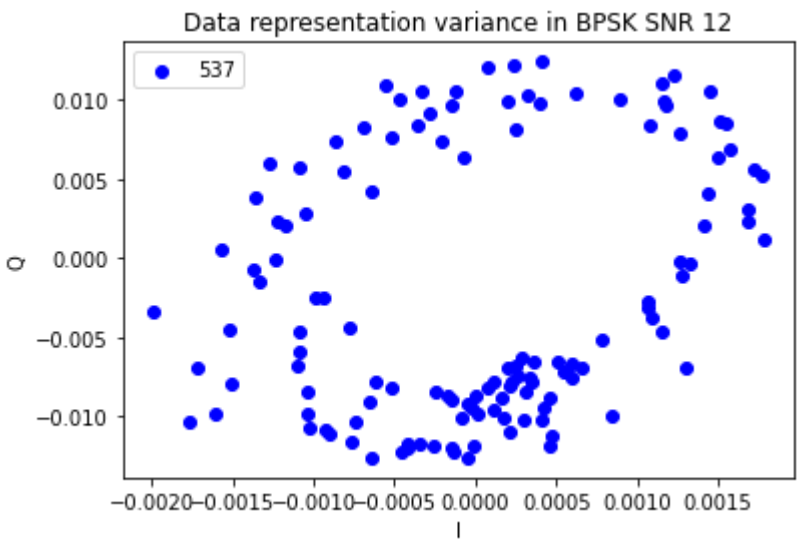
Data representation variance in BPSK SNR 12
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−0.010
Q
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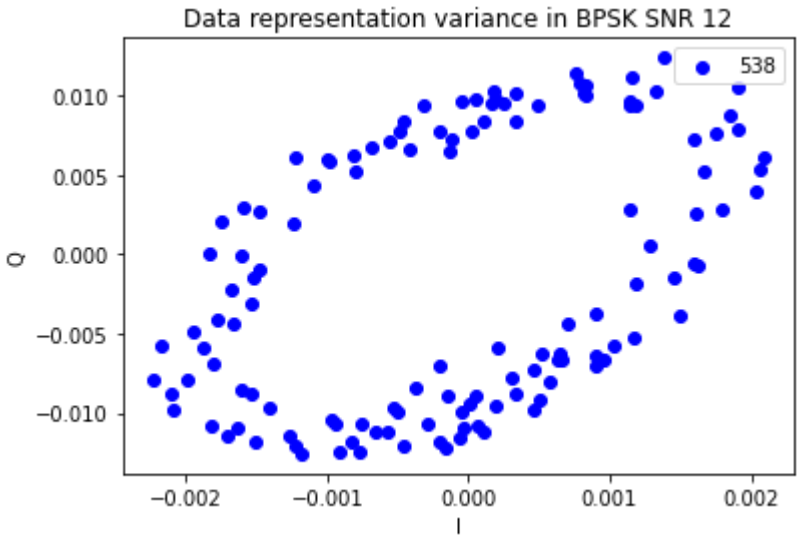
Data representation variance in BPSK SNR 12
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0.000
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−0.010
Q
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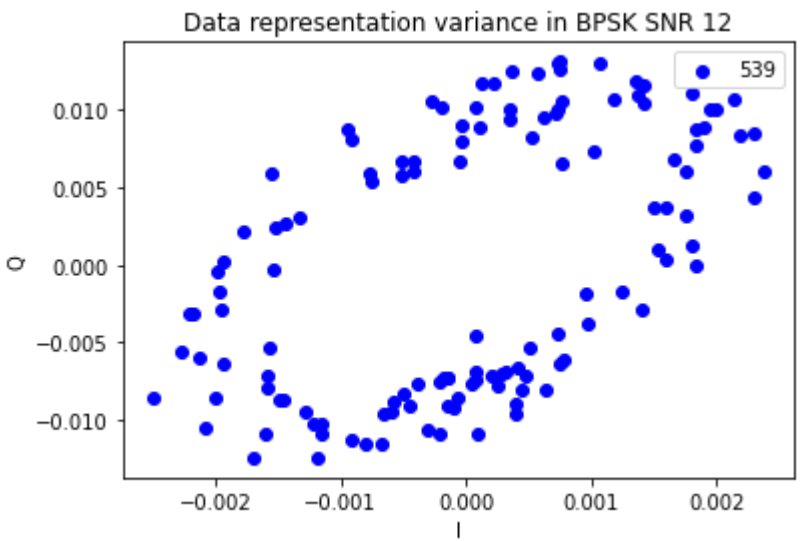
Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
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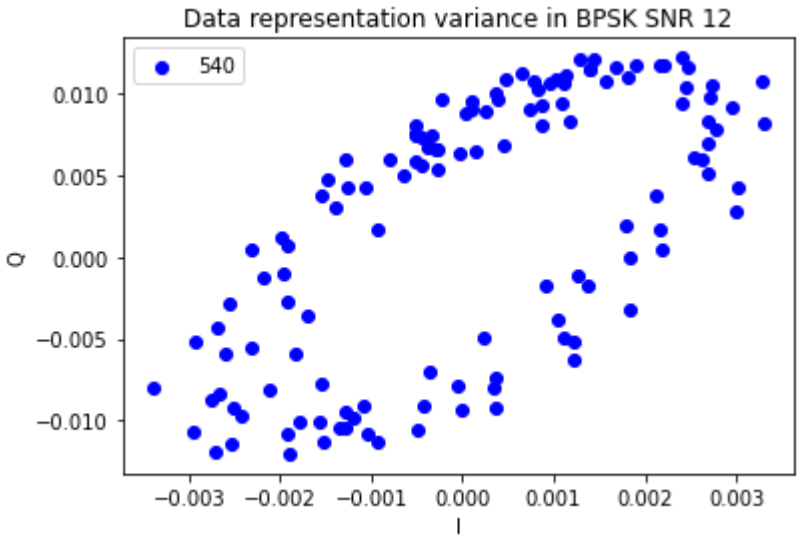
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0.005
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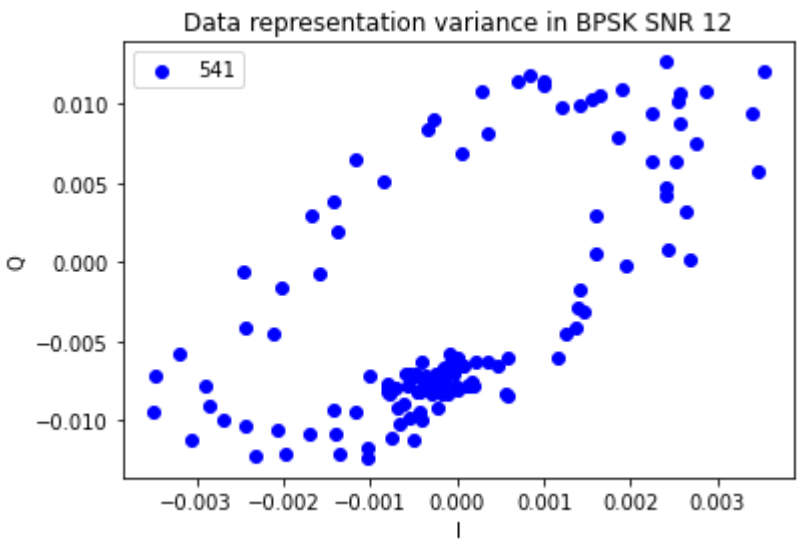
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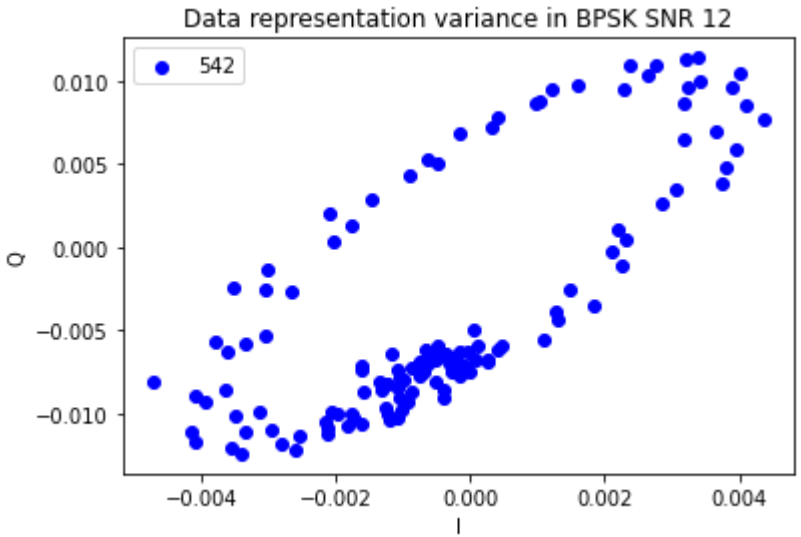
Data representation variance in BPSK SNR 12
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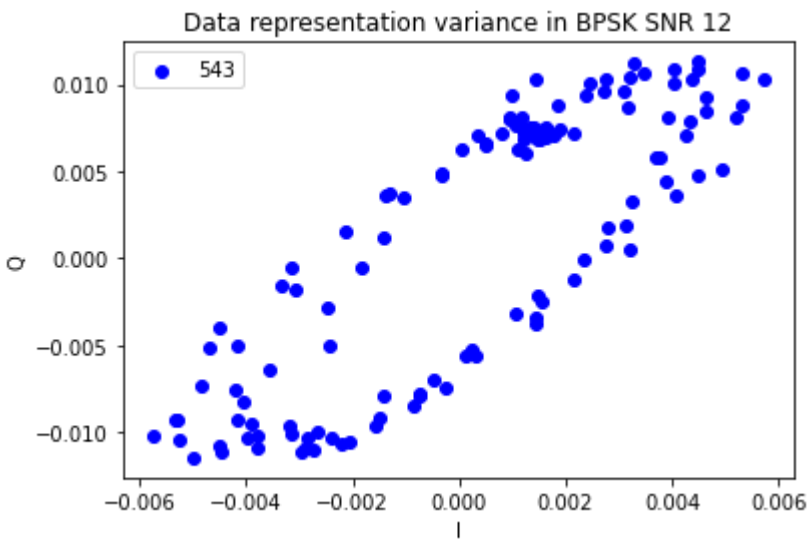
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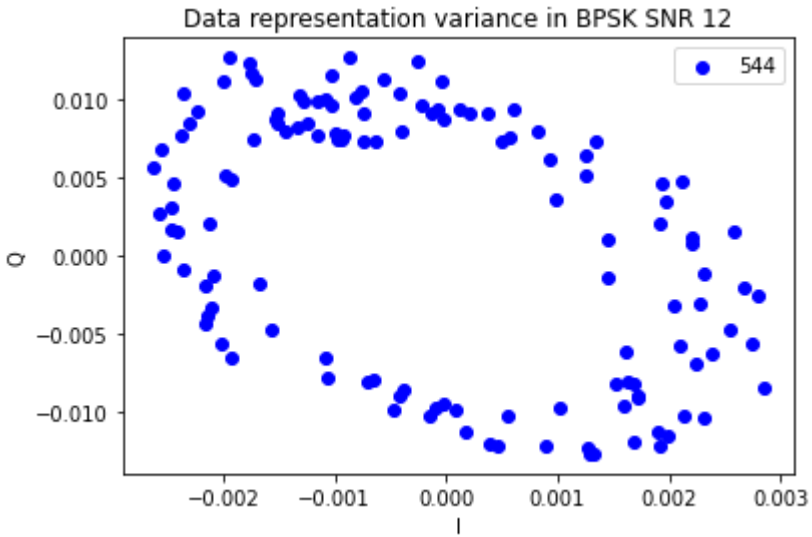
Data representation variance in BPSK SNR 12
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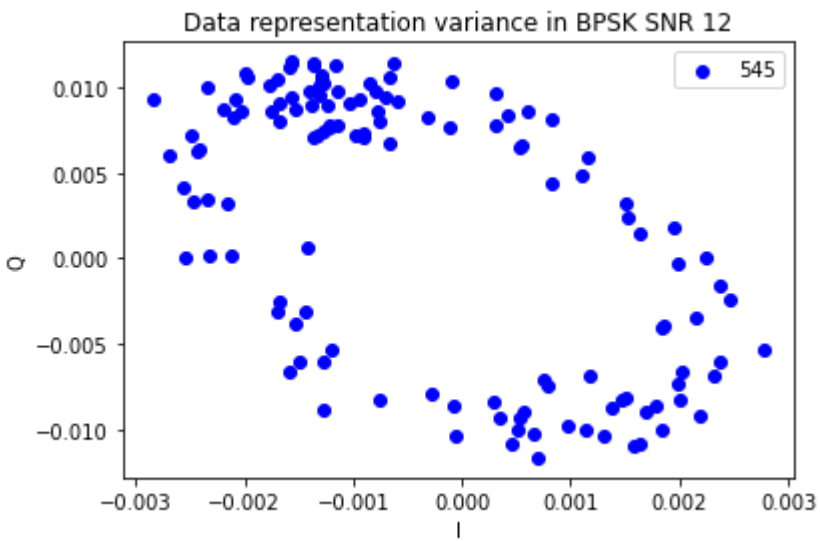
Data representation variance in BPSK SNR 12
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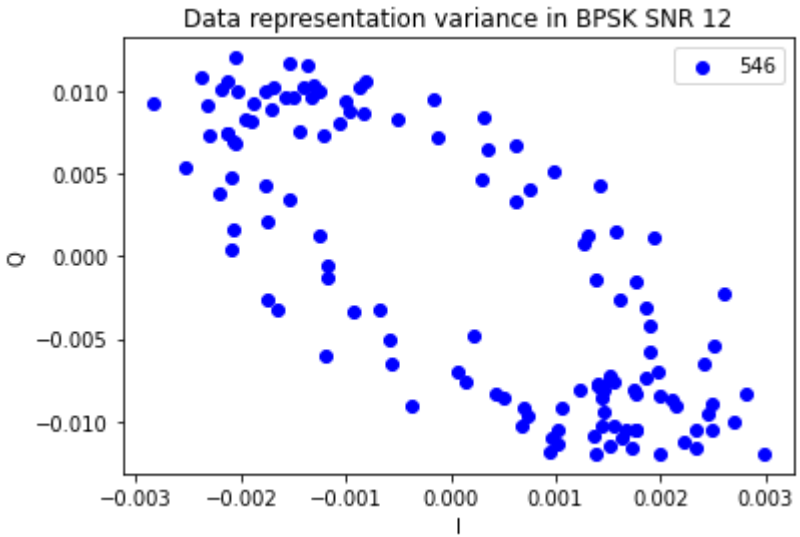
Data representation variance in BPSK SNR 12
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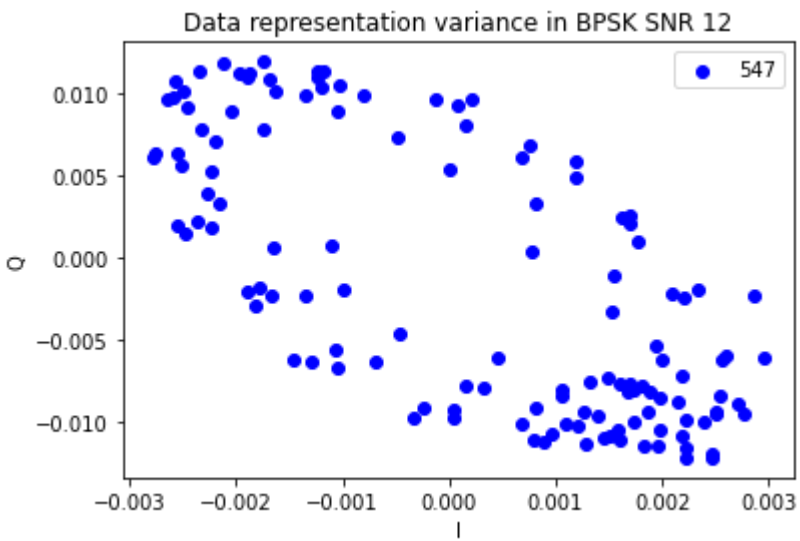
Data representation variance in BPSK SNR 12
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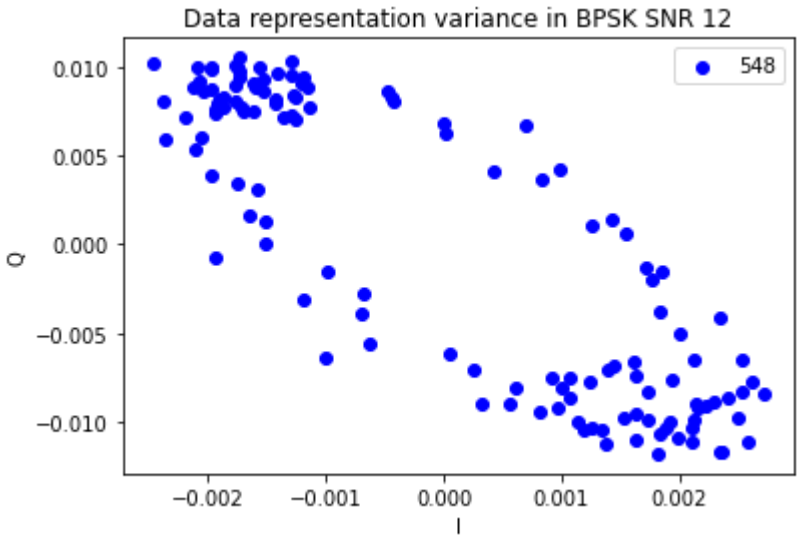
Data representation variance in BPSK SNR 12
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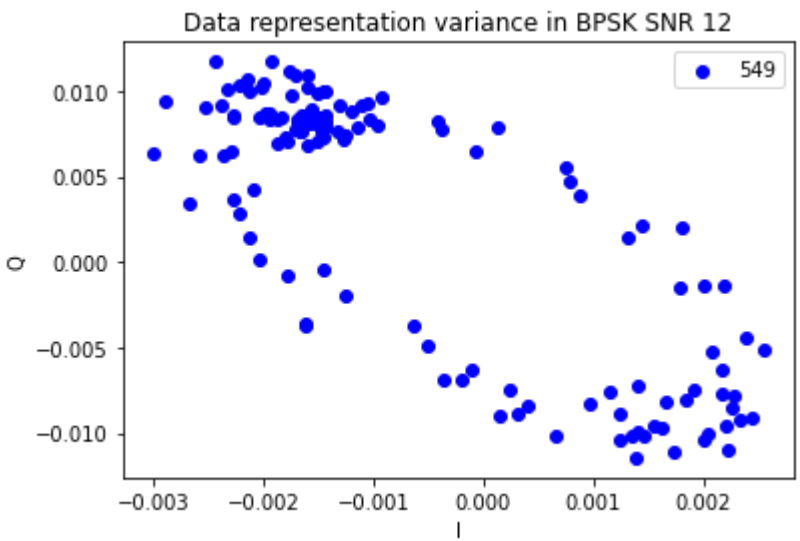
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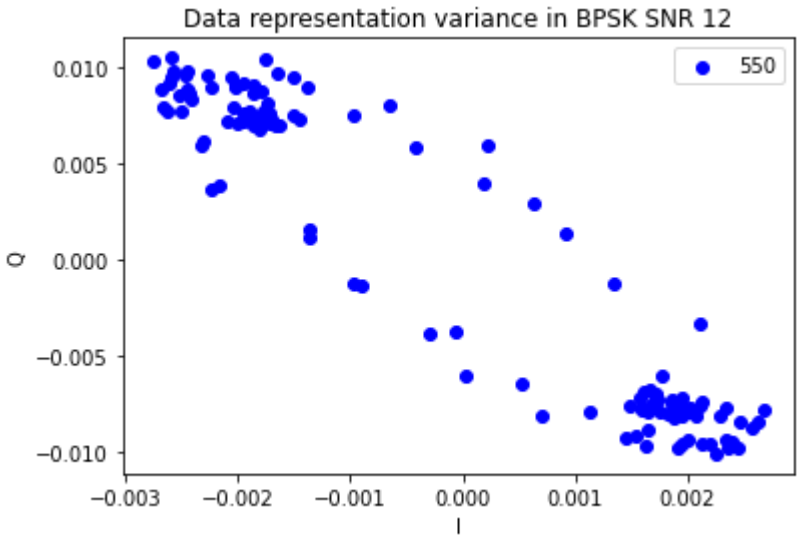
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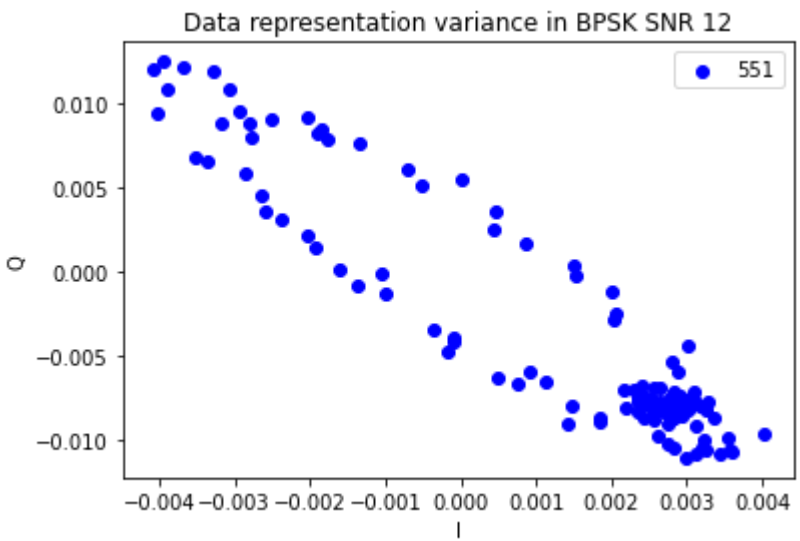
Data representation variance in BPSK SNR 12
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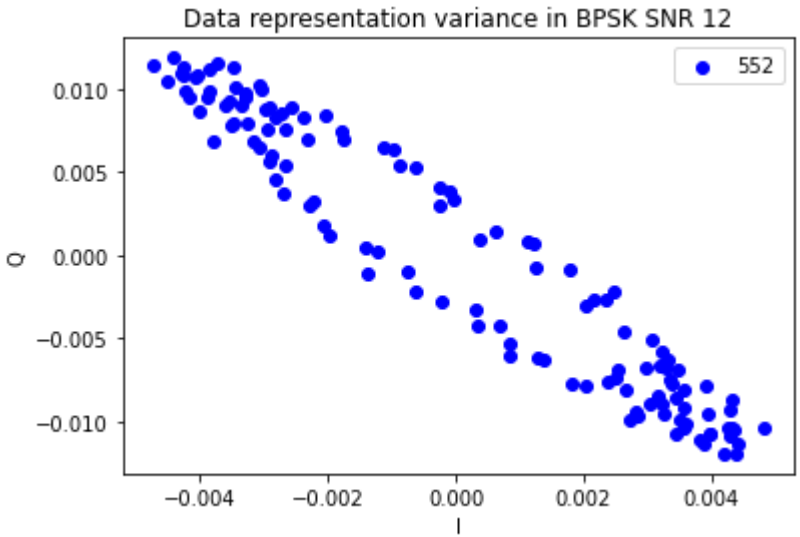
Data representation variance in BPSK SNR 12
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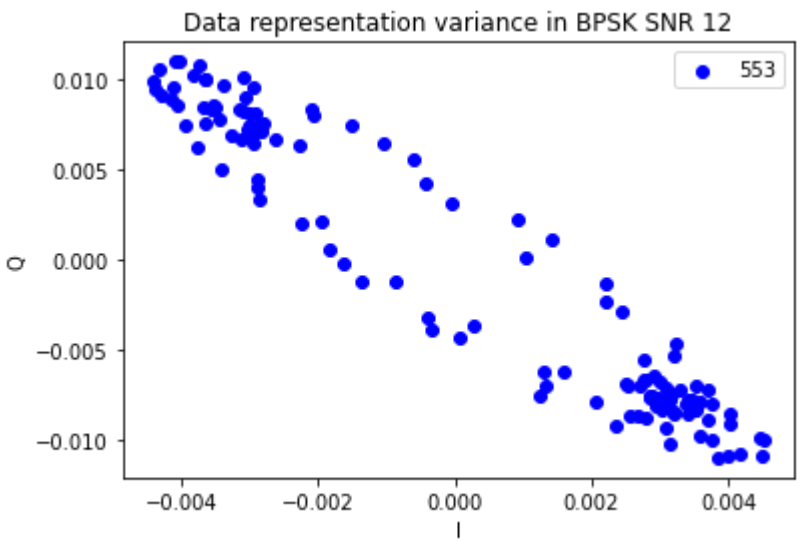
Data representation variance in BPSK SNR 12
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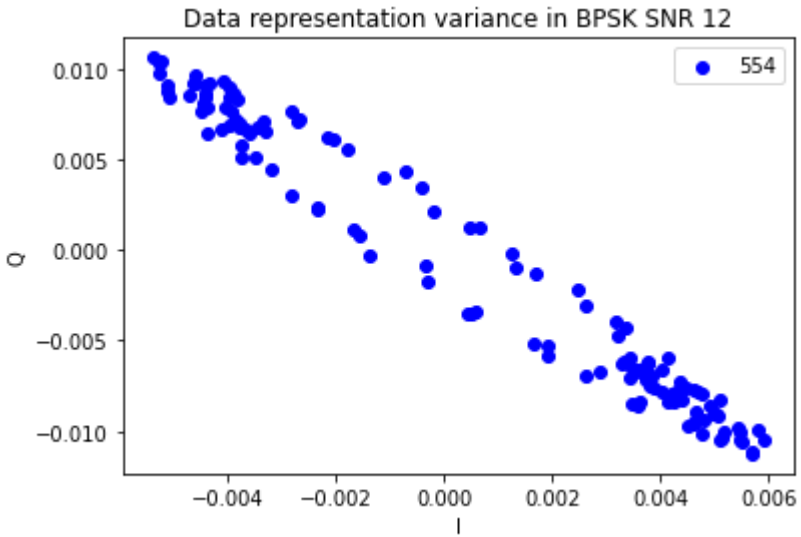
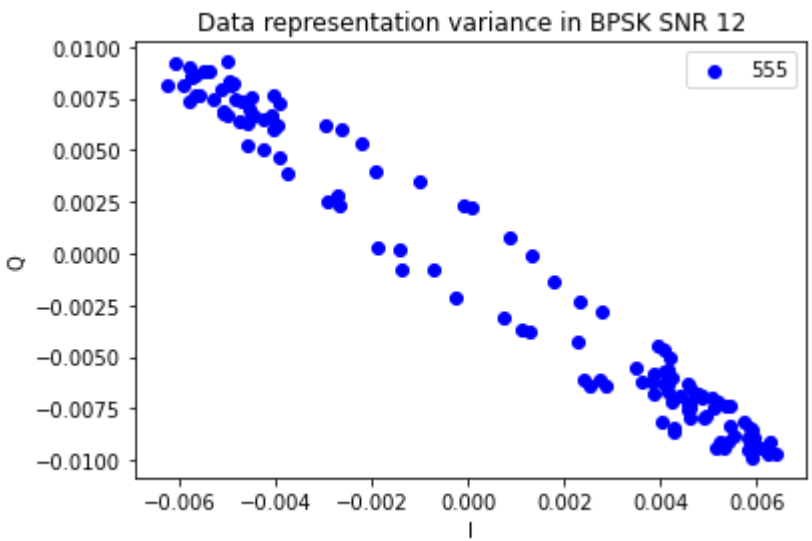
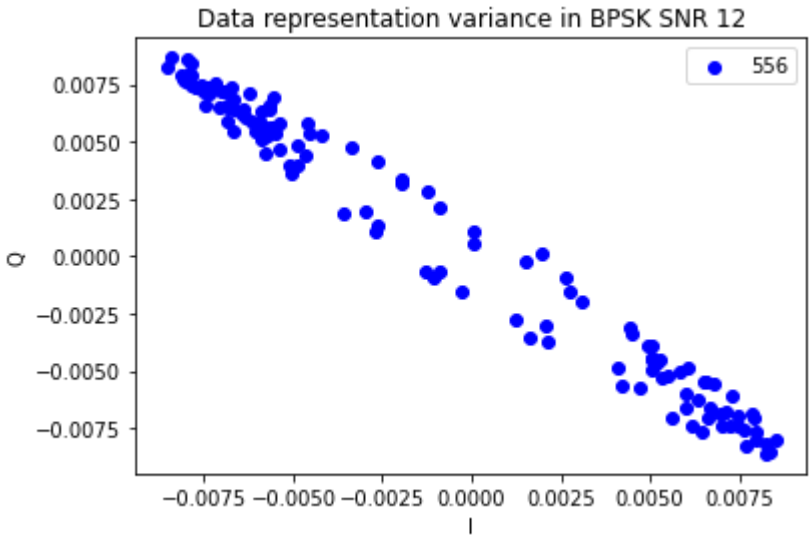
0.004
I


Data representation variance in BPSK SNR 12
554
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
555
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
556
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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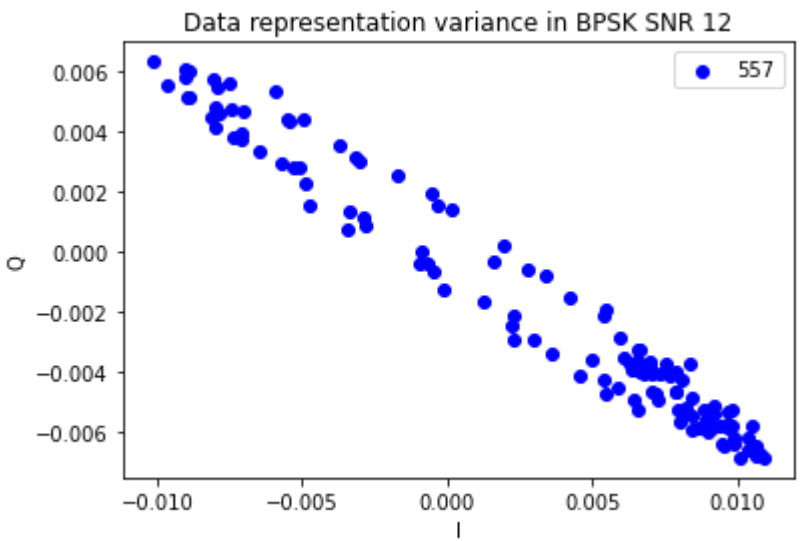
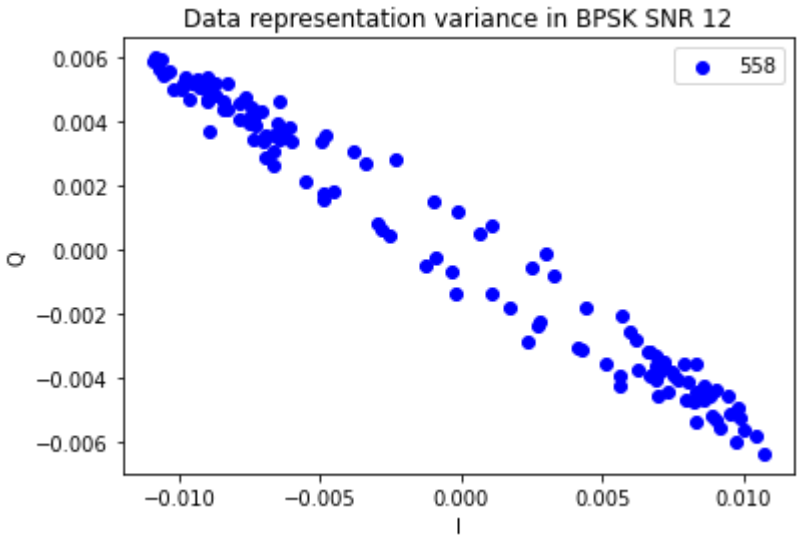
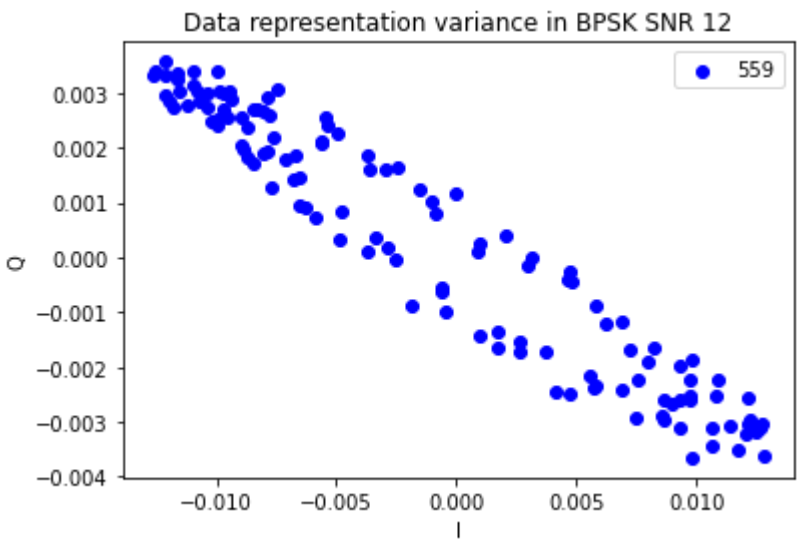
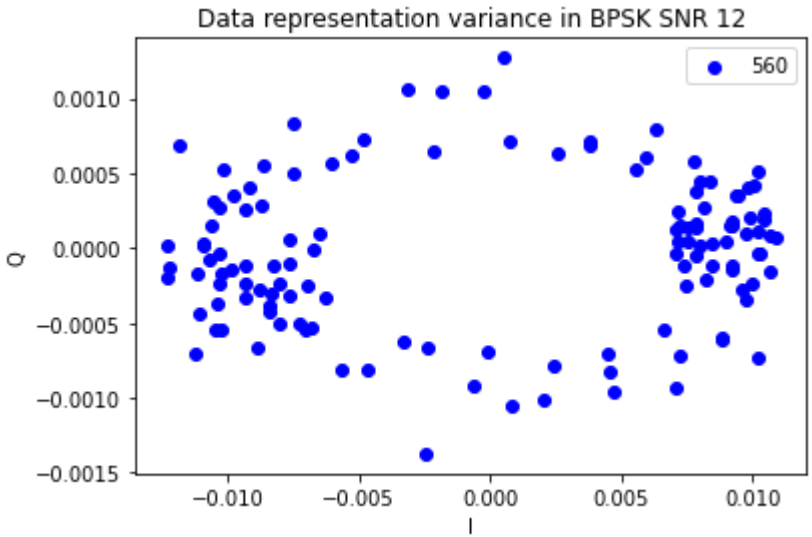
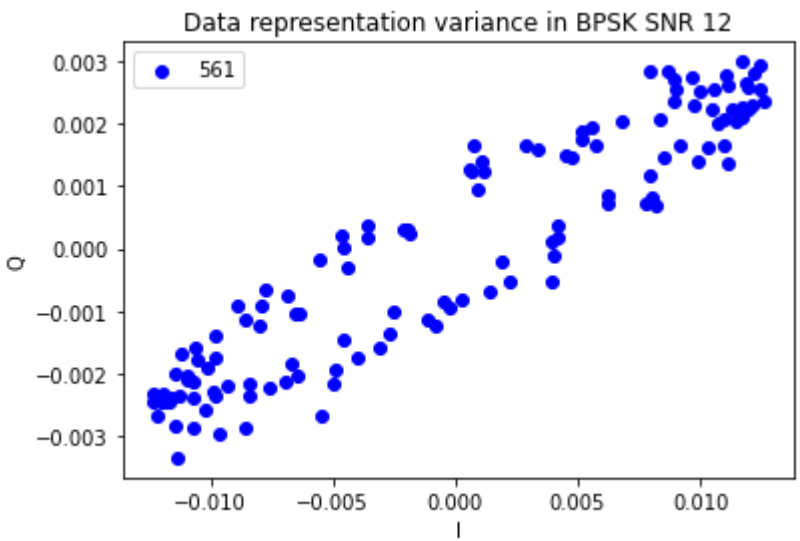
I

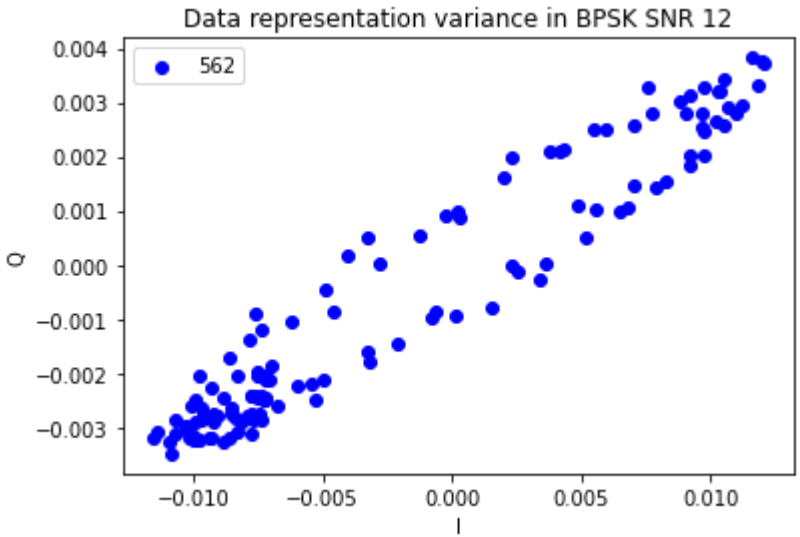

Data representation variance in BPSK SNR 12
557
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010 −0.005 0.000 0.005 0.010
I

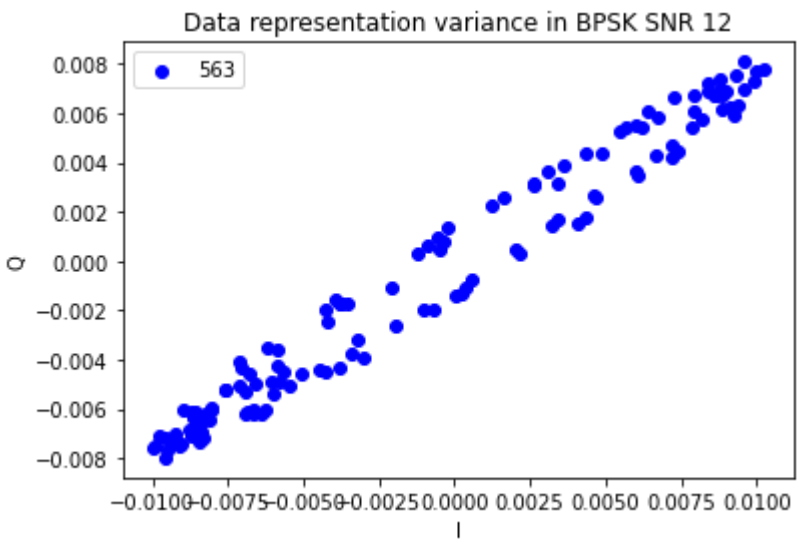

Data representation variance in BPSK SNR 12
558
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
559
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
560
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
561
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
562
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
563
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
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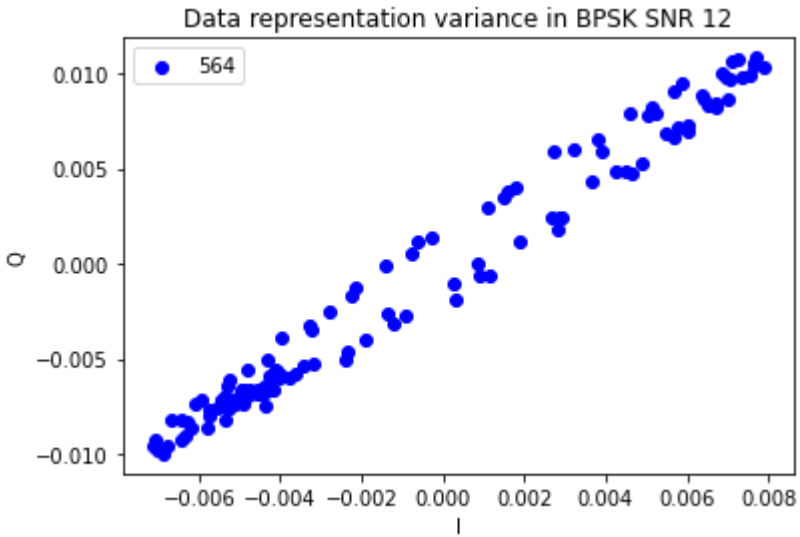
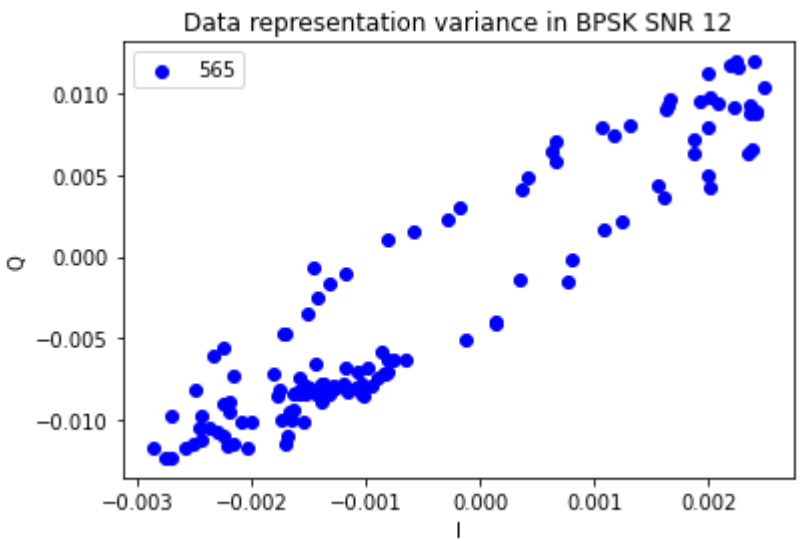
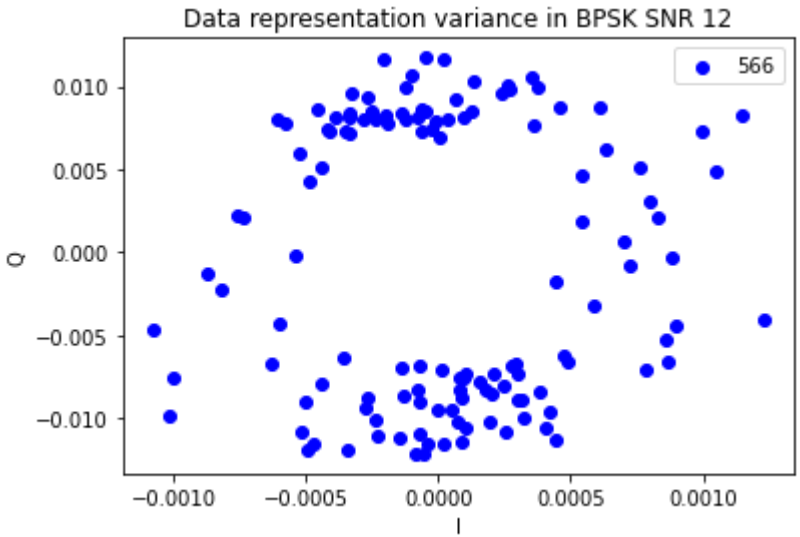
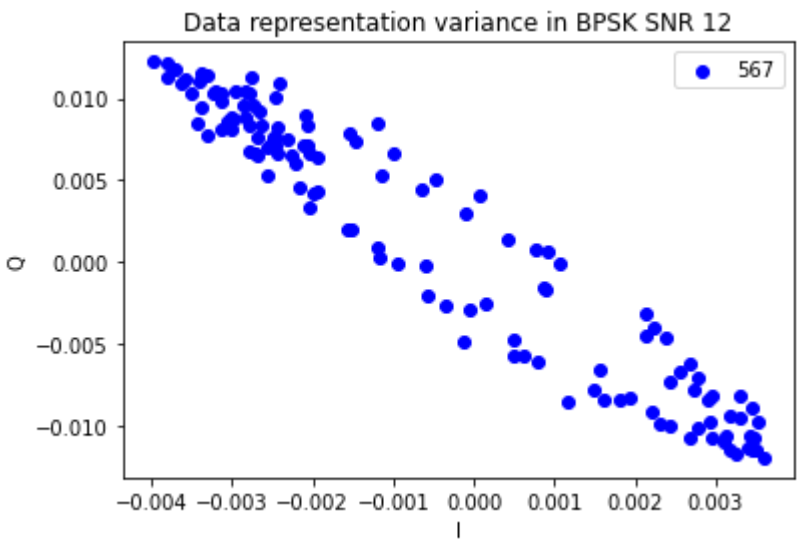
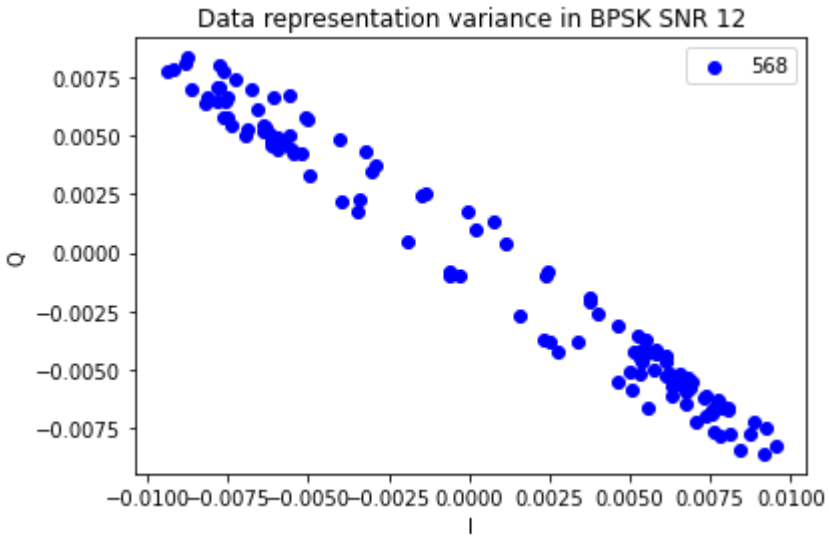
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

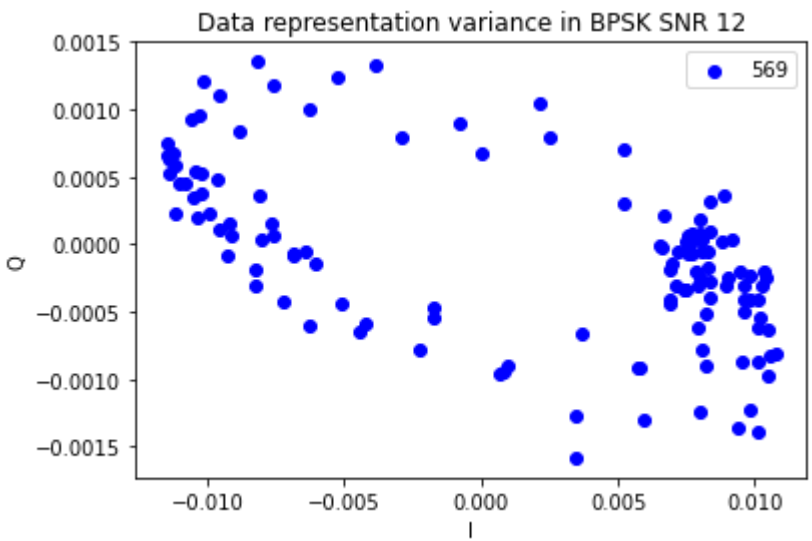

Data representation variance in BPSK SNR 12
564
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
565
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002
I


Data representation variance in BPSK SNR 12
566
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0010
−0.0005
0.0000
0.0005
0.0010
I


Data representation variance in BPSK SNR 12
567
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
568
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
569
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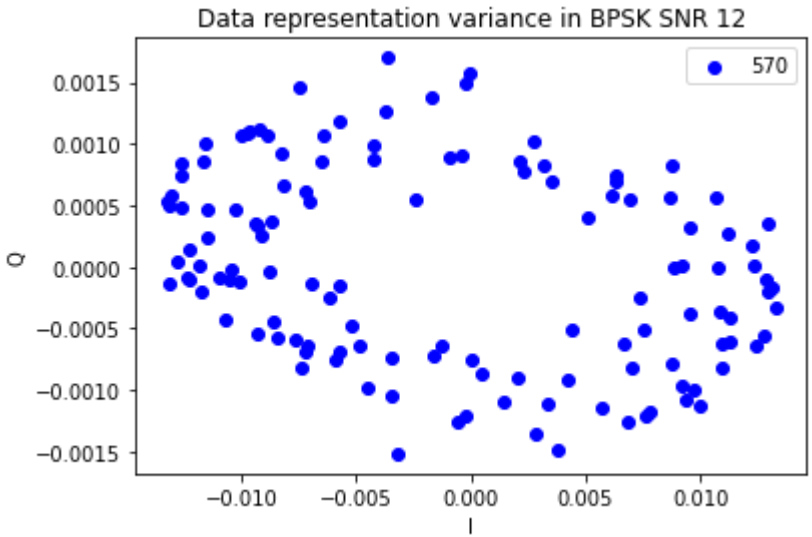
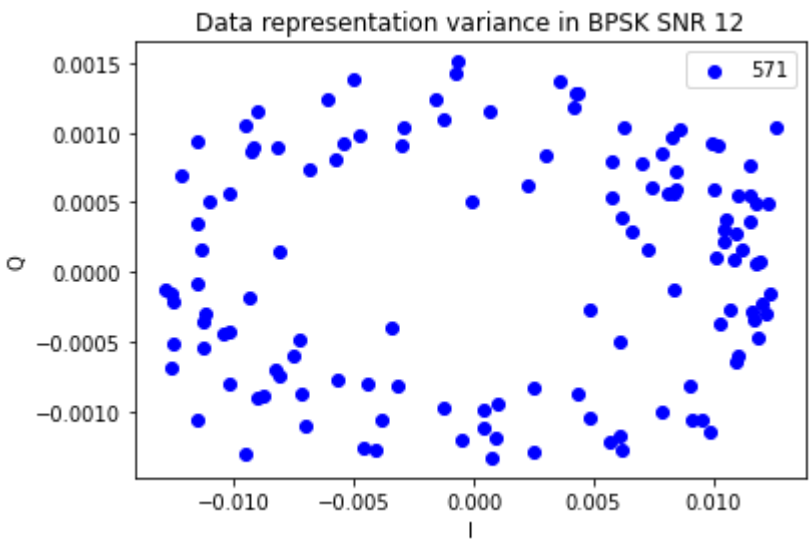
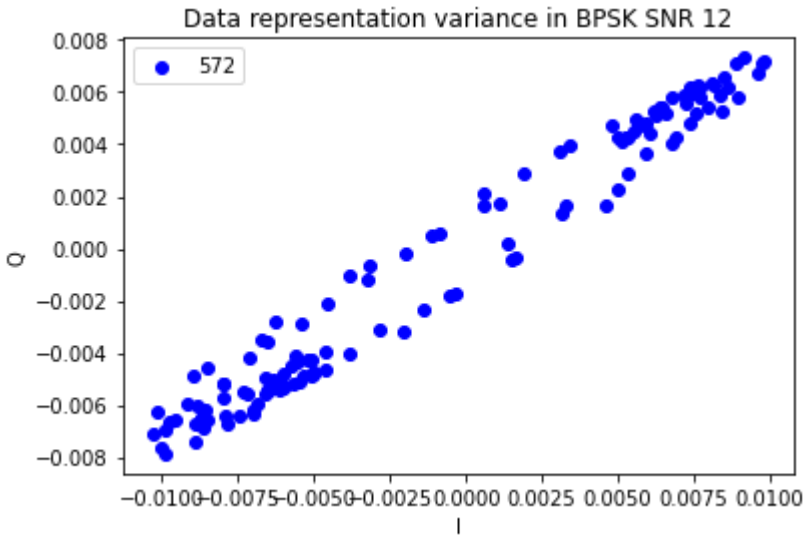
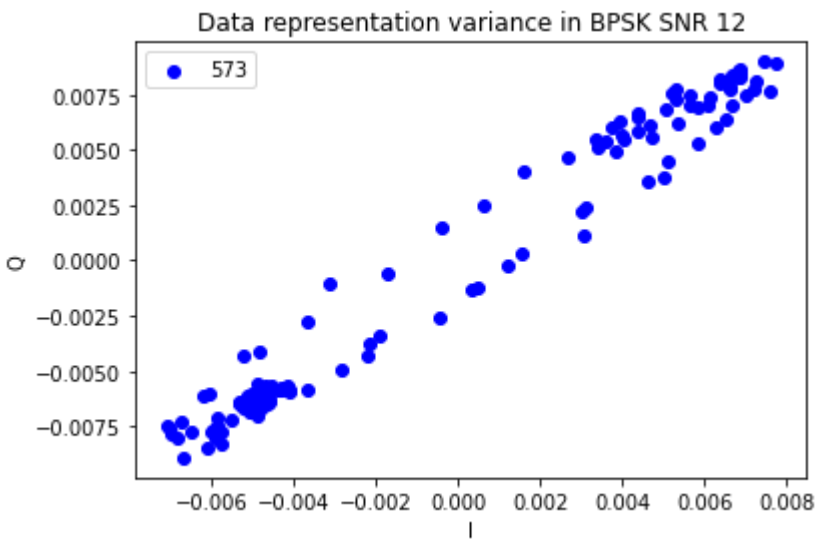
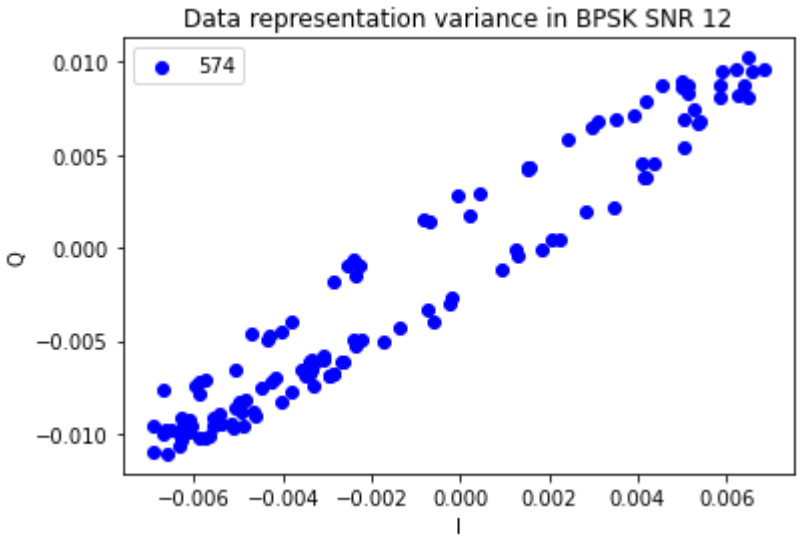
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010 −0.005 0.000 0.005 0.010
I

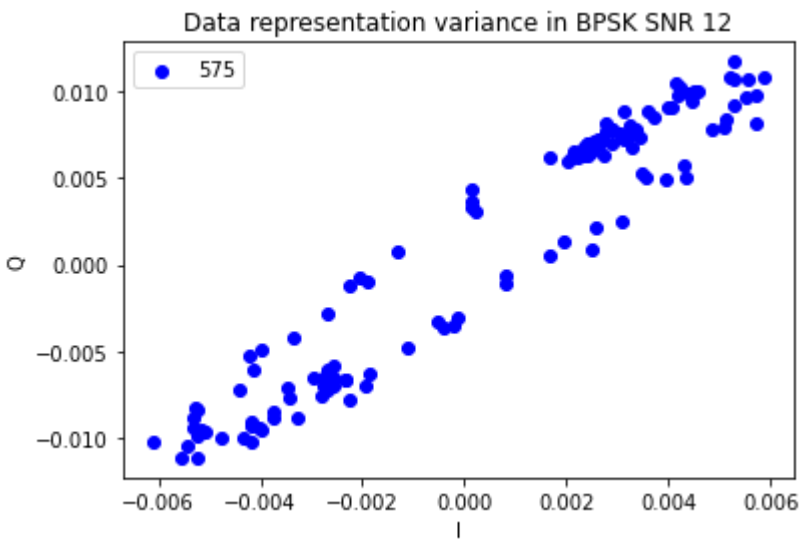

Data representation variance in BPSK SNR 12
570
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

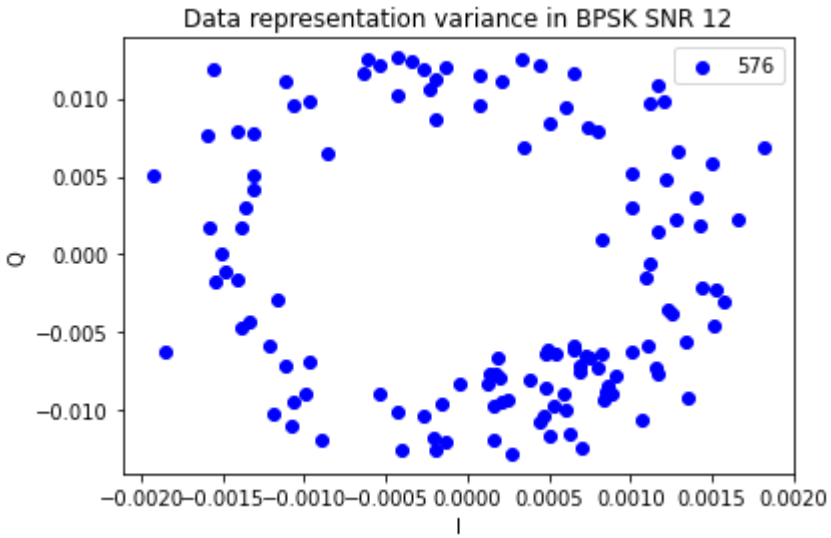

Data representation variance in BPSK SNR 12
571
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

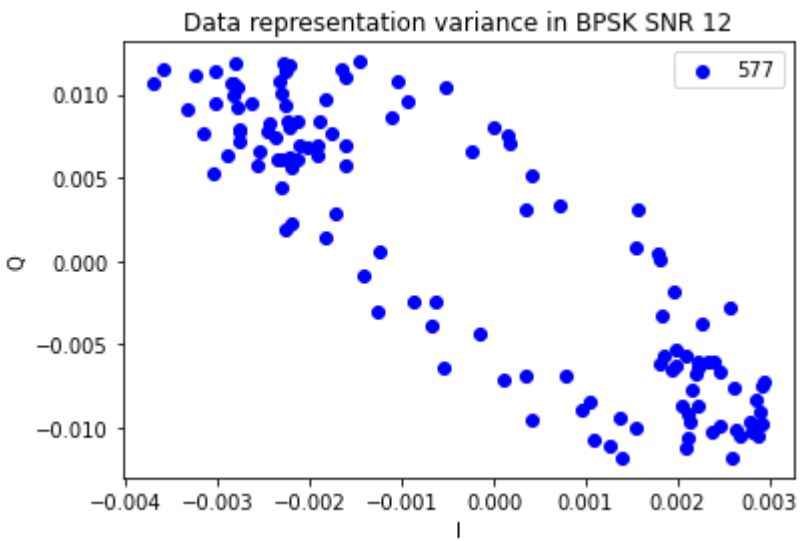

Data representation variance in BPSK SNR 12
572
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

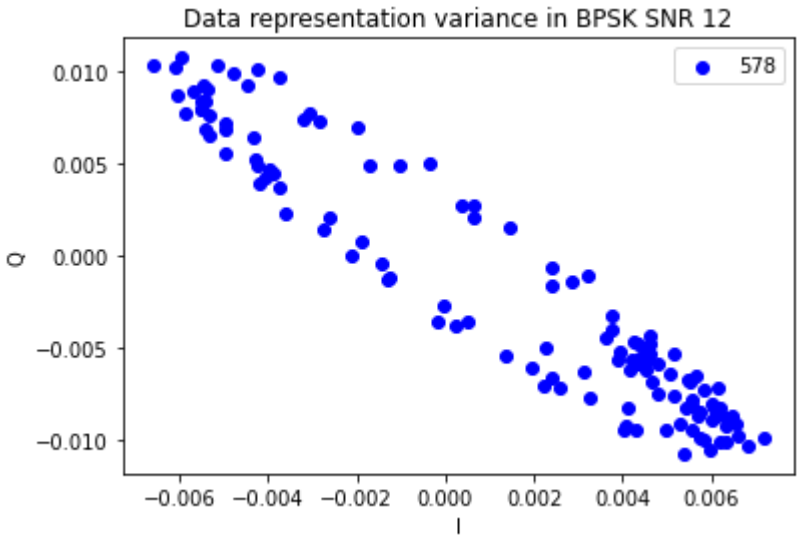

Data representation variance in BPSK SNR 12
573
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

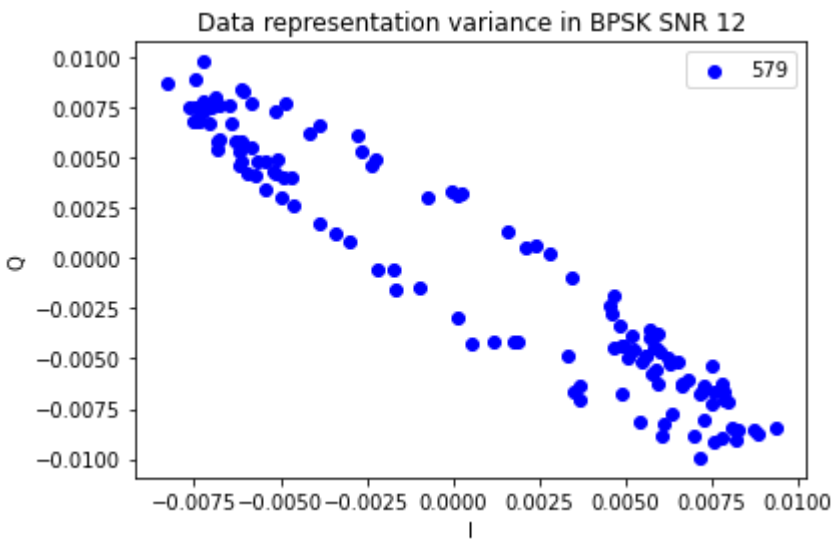

Data representation variance in BPSK SNR 12
574
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

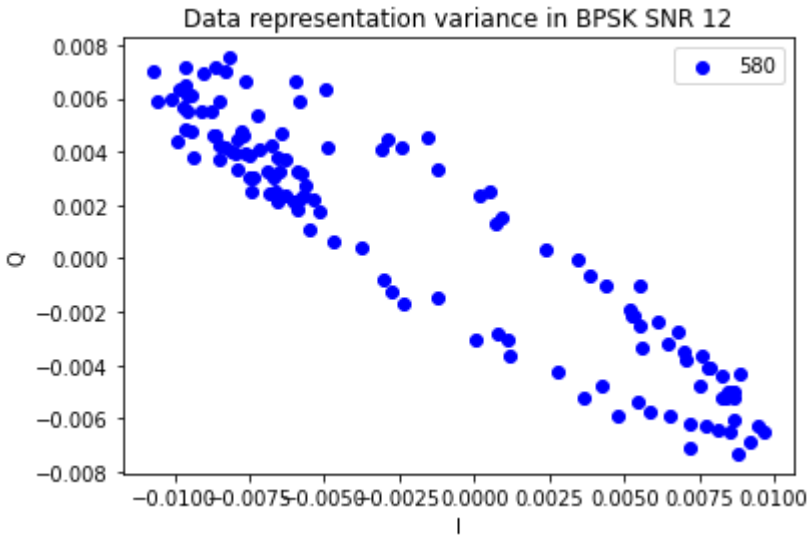

Data representation variance in BPSK SNR 12
575
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

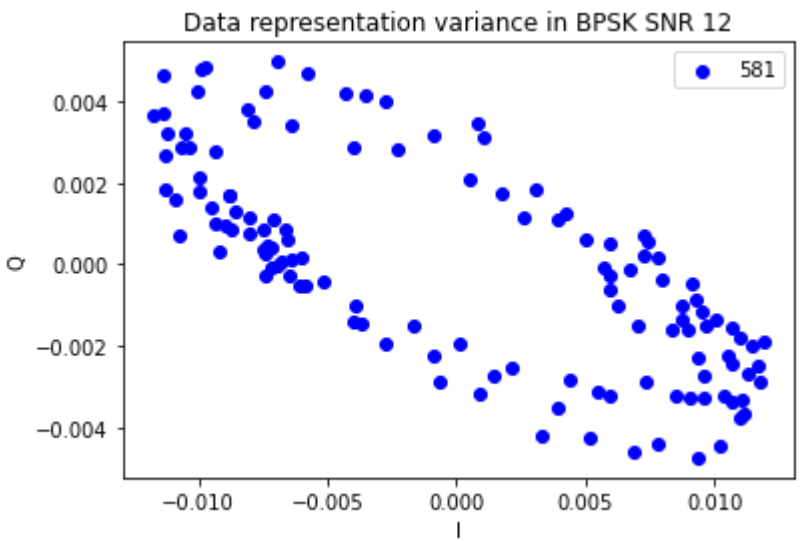

Data representation variance in BPSK SNR 12
576
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

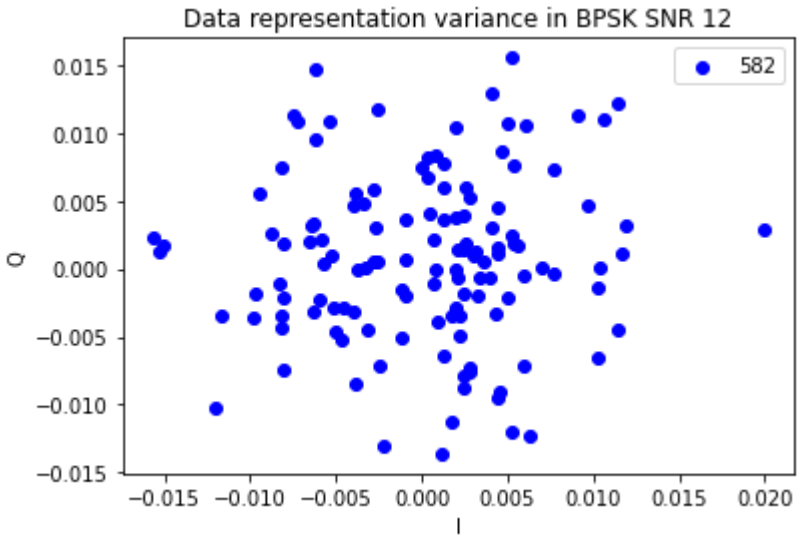

Data representation variance in BPSK SNR 12
577
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

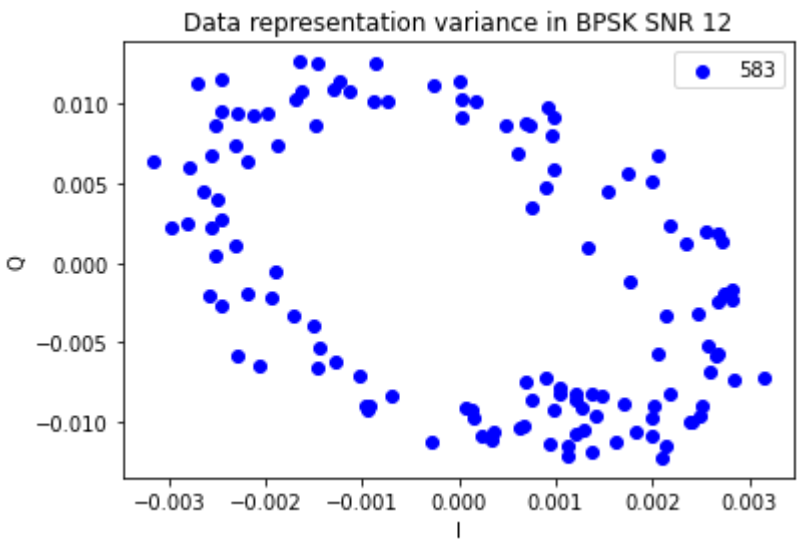

Data representation variance in BPSK SNR 12
578
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
579
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
580
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
581
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010 −0.005 0.000 0.005 0.010
I


Data representation variance in BPSK SNR 12
582
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.015 −0.010 −0.005 0.000 0.005 0.010 0.015 0.020
I


Data representation variance in BPSK SNR 12
583
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0.005
0.000
−0.005
−0.010
Q
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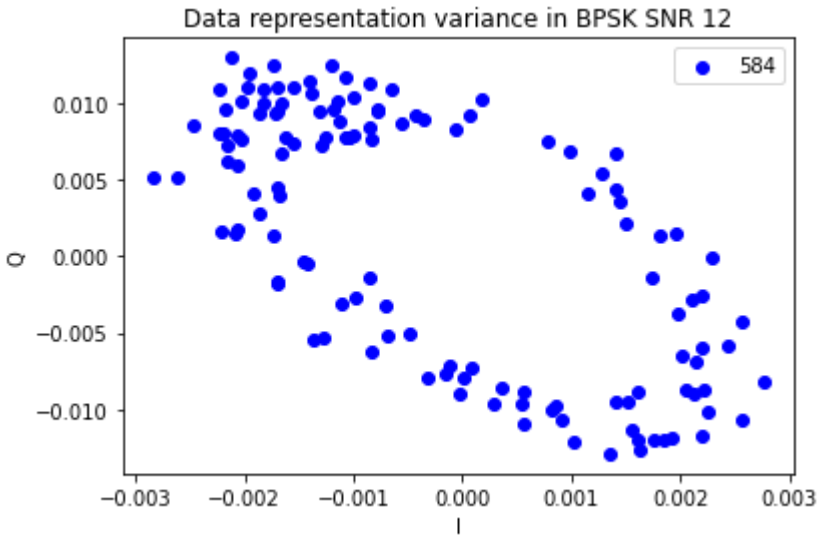
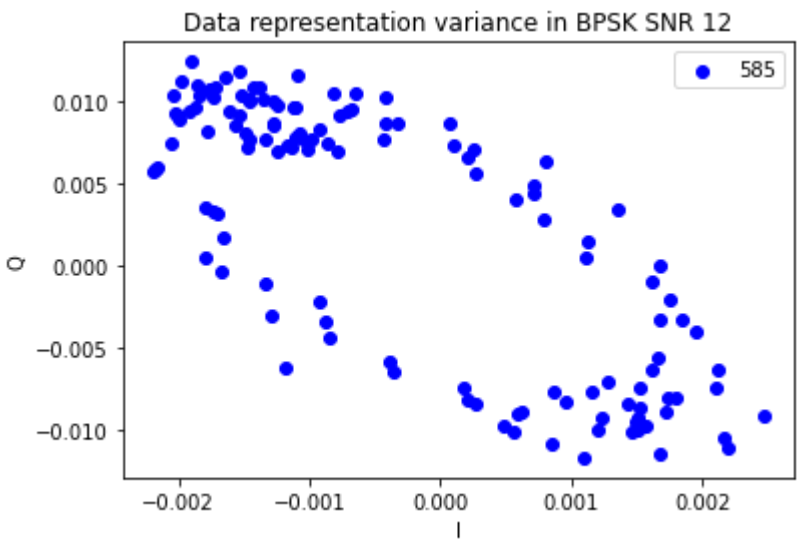
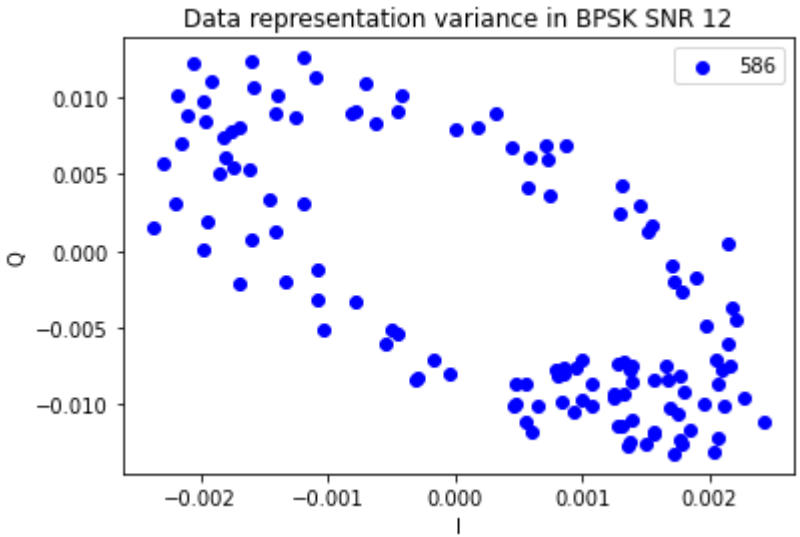
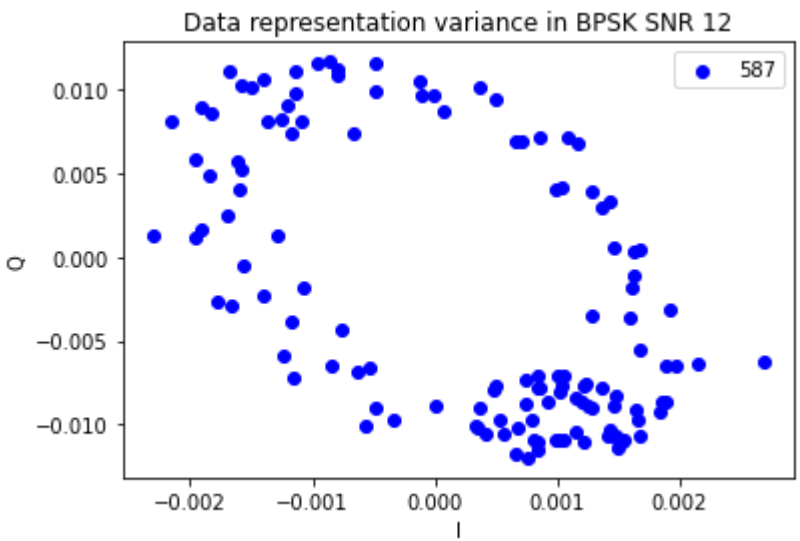
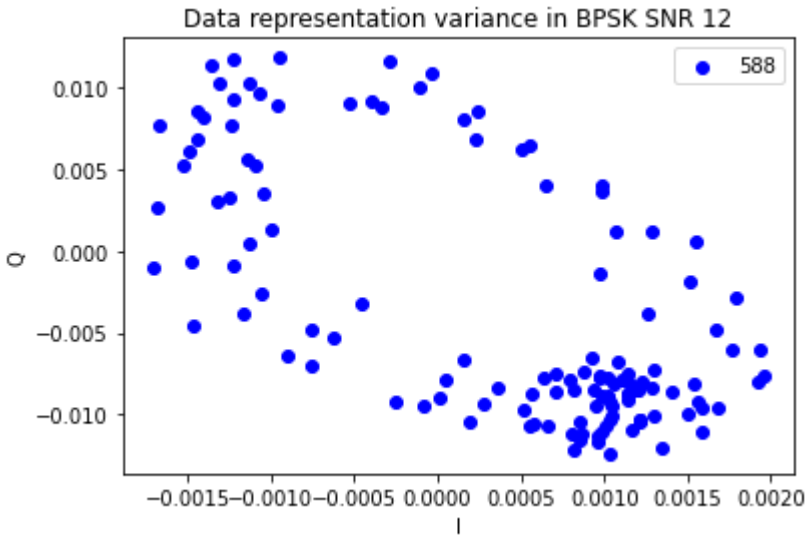
I


Data representation variance in BPSK SNR 12
584
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
585
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
586
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
587
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
588
0.010
0.005
0.000
−0.005
−0.010
Q
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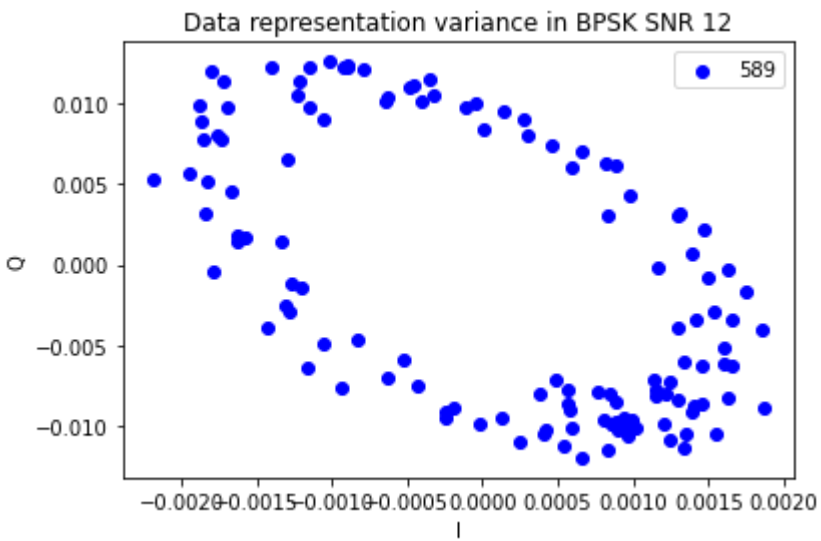
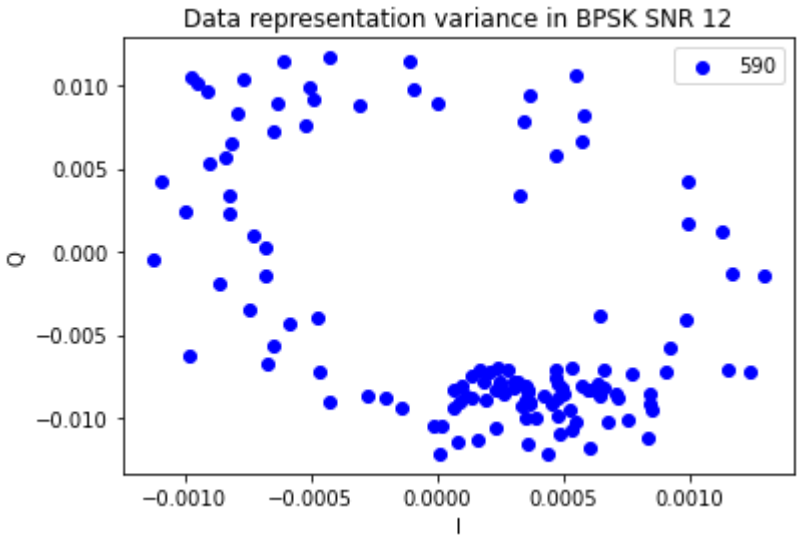
I


Data representation variance in BPSK SNR 12
589
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I


Data representation variance in BPSK SNR 12
590
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0010
−0.0005
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0.0010
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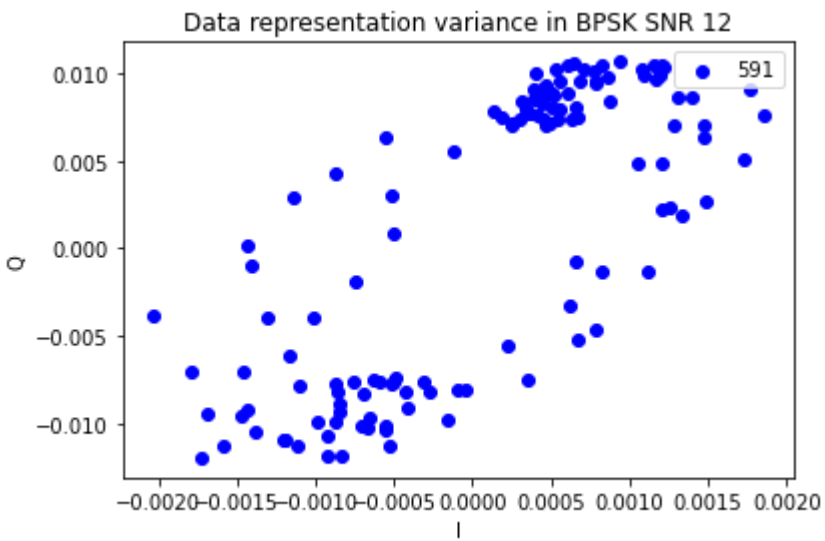
Data representation variance in BPSK SNR 12
591
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.0015
−0.0010
−0.0005
0.0000
0.0005
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0.0015
0.0020
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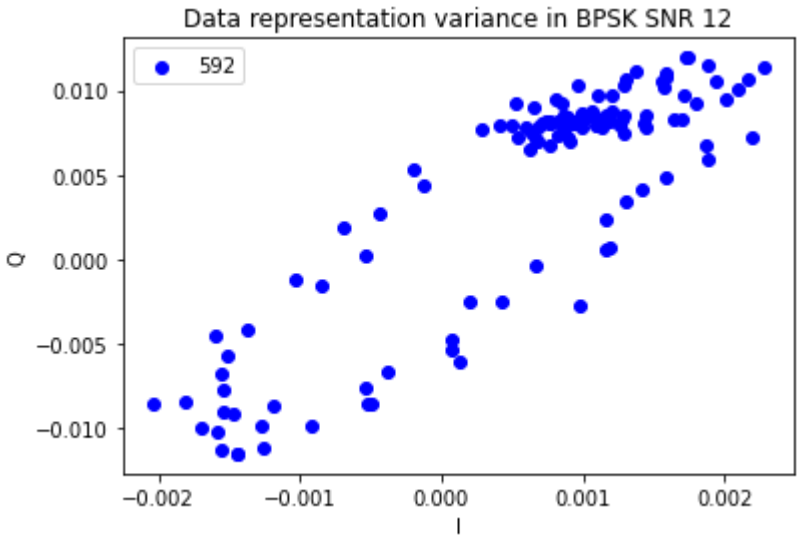
Data representation variance in BPSK SNR 12
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0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
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0.001
0.002
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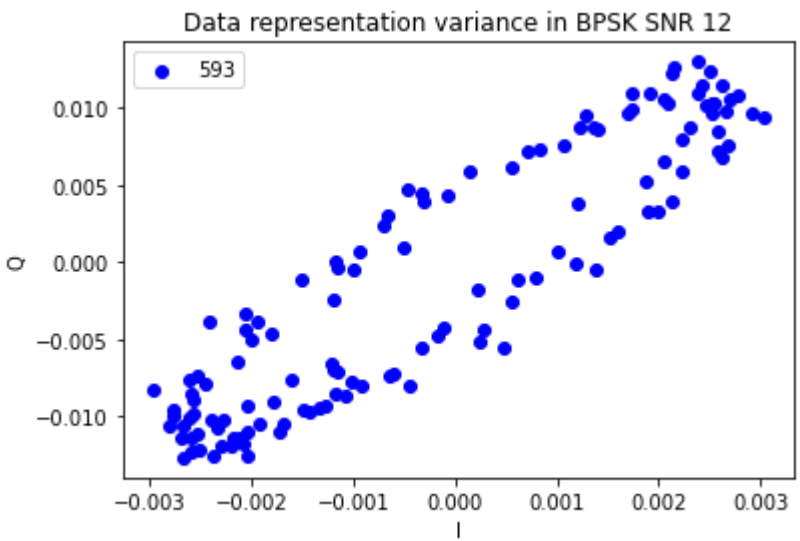
Data representation variance in BPSK SNR 12
593
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
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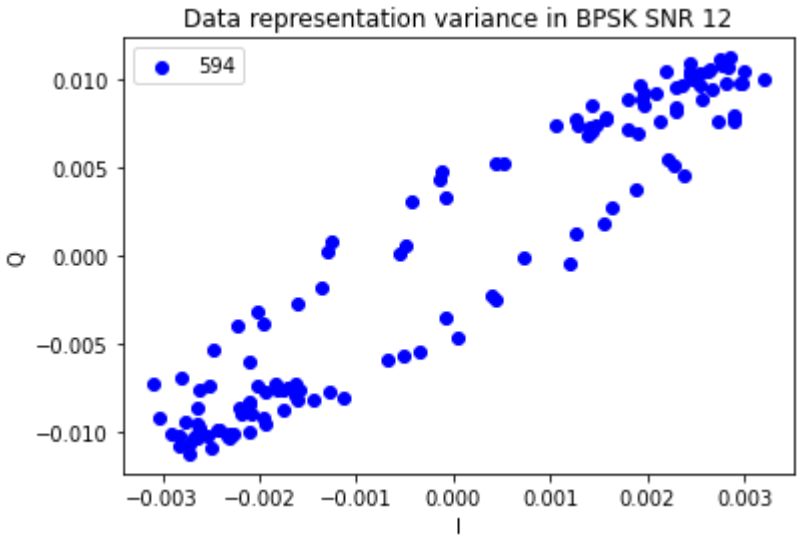
Data representation variance in BPSK SNR 12
594
0.010
0.005
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−0.005
−0.010
Q
−0.003
−0.002
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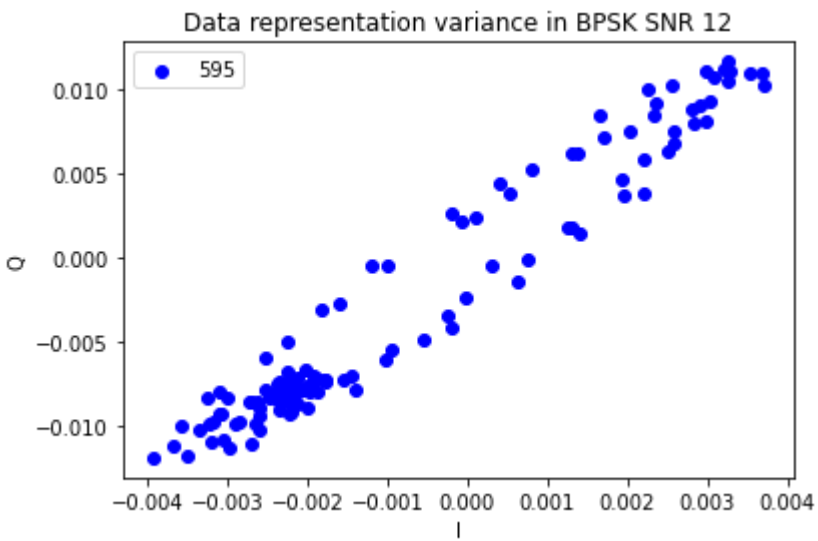
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
595
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.003
−0.002
−0.001
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0.004
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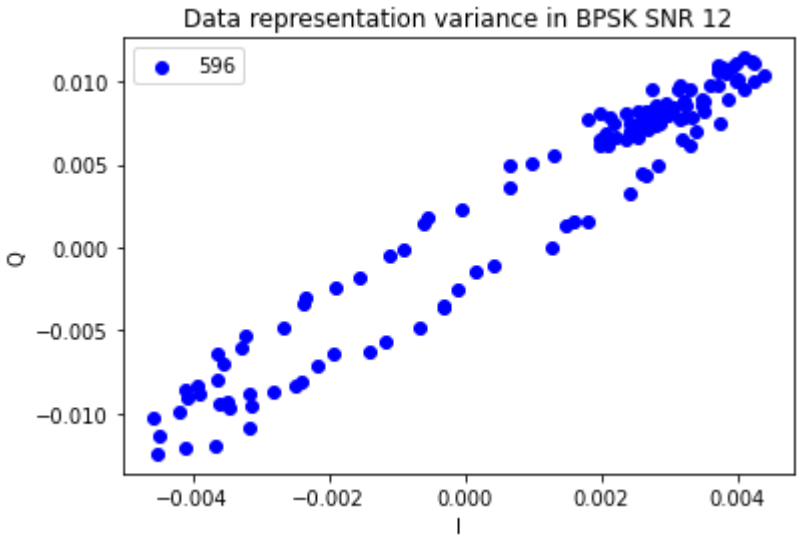
Data representation variance in BPSK SNR 12
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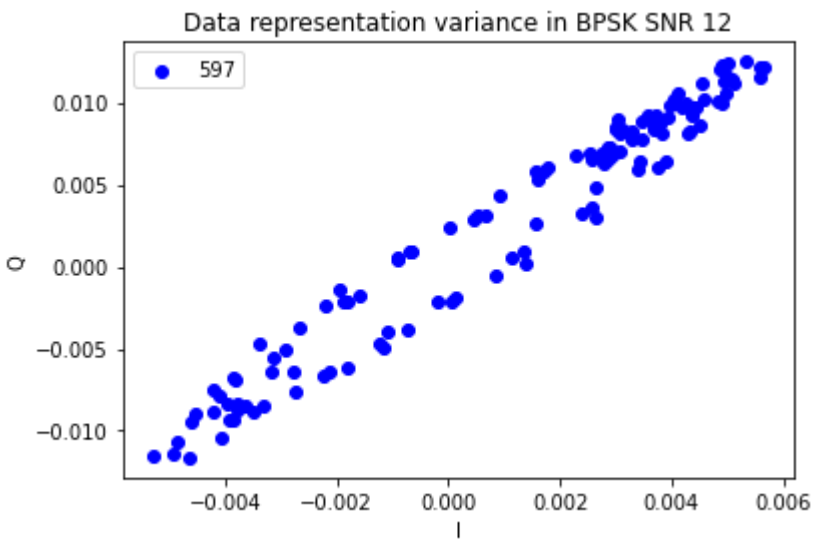
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
597
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
0.006
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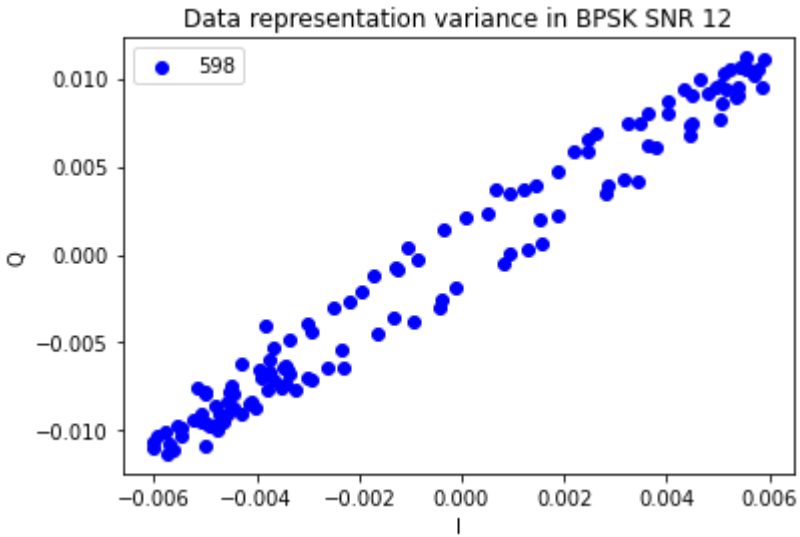
Data representation variance in BPSK SNR 12
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0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
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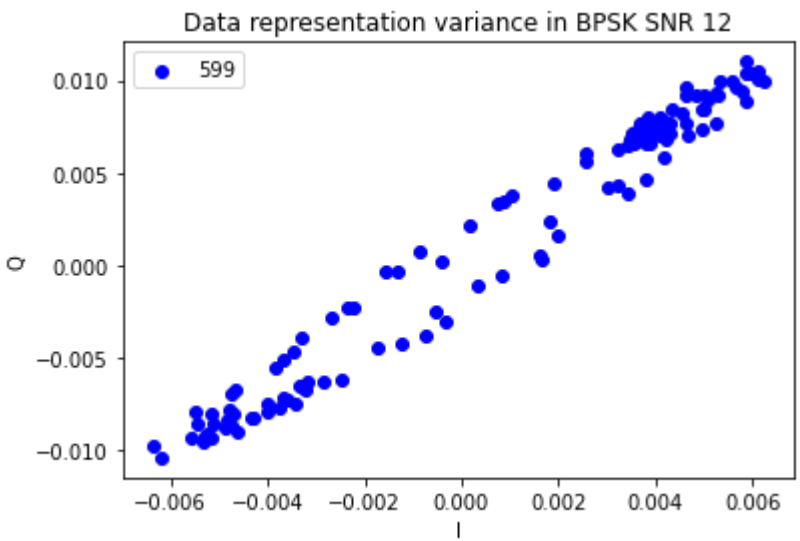
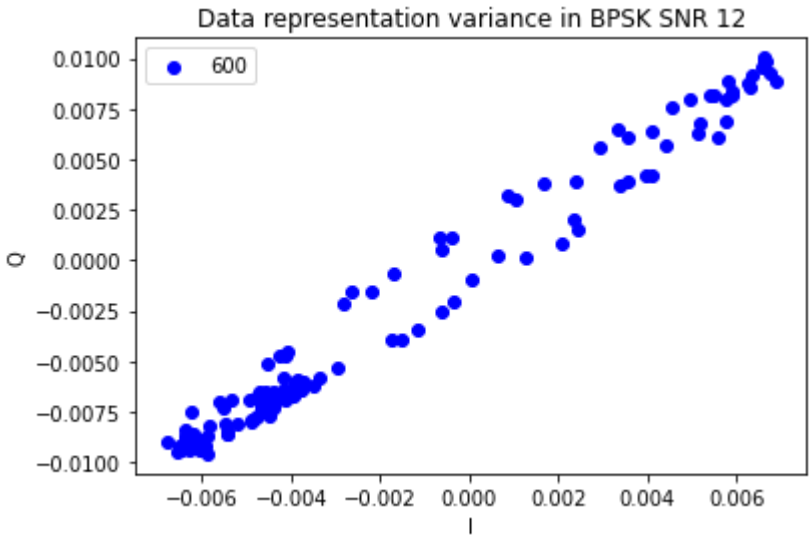

Data representation variance in BPSK SNR 12
599
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
600
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0.0075
0.0050
0.0025
0.0000
−0.0025
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−0.0075
−0.0100
Q
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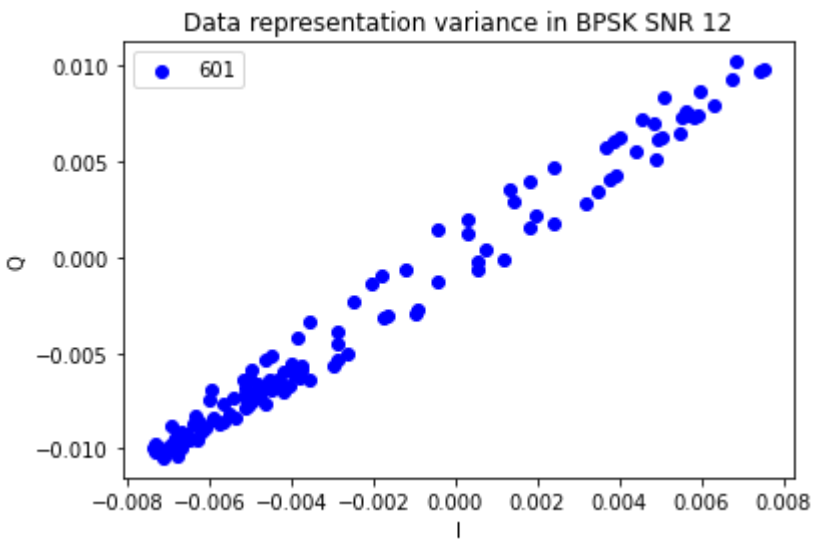
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
601
0.010
0.005
0.000
−0.005
−0.010
Q
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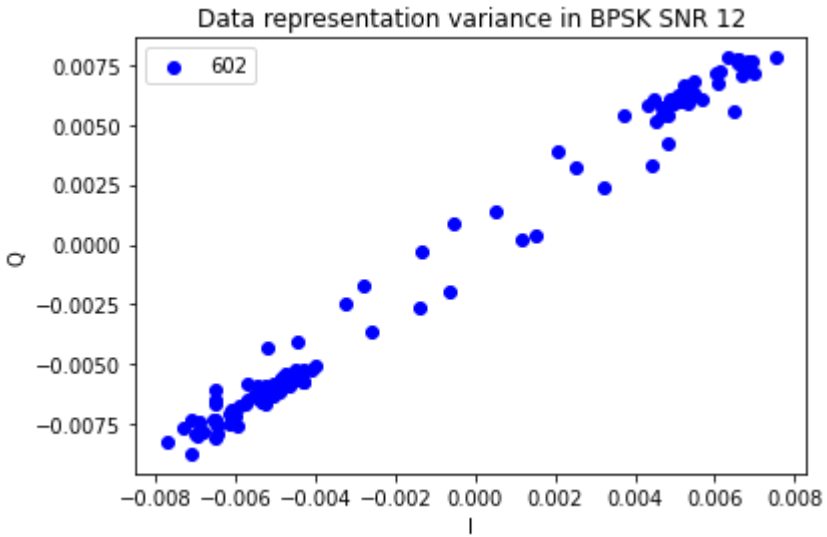
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I


Data representation variance in BPSK SNR 12
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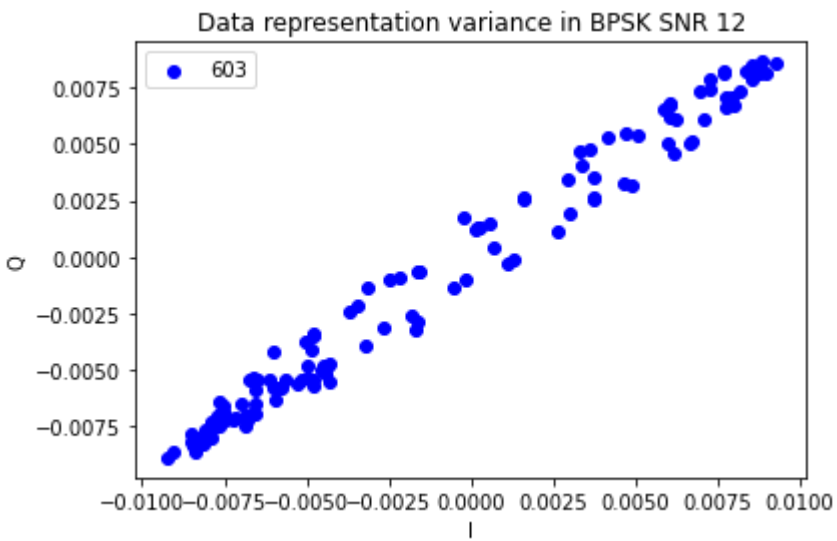
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
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0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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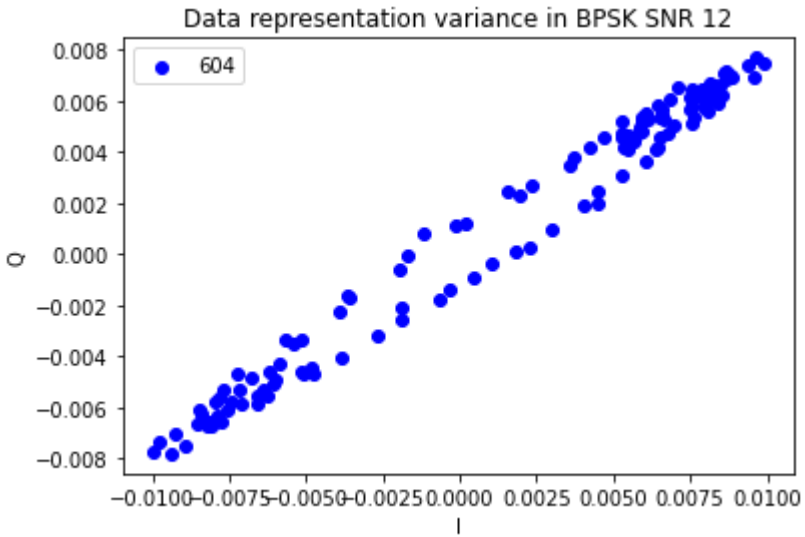
I


Data representation variance in BPSK SNR 12
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0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
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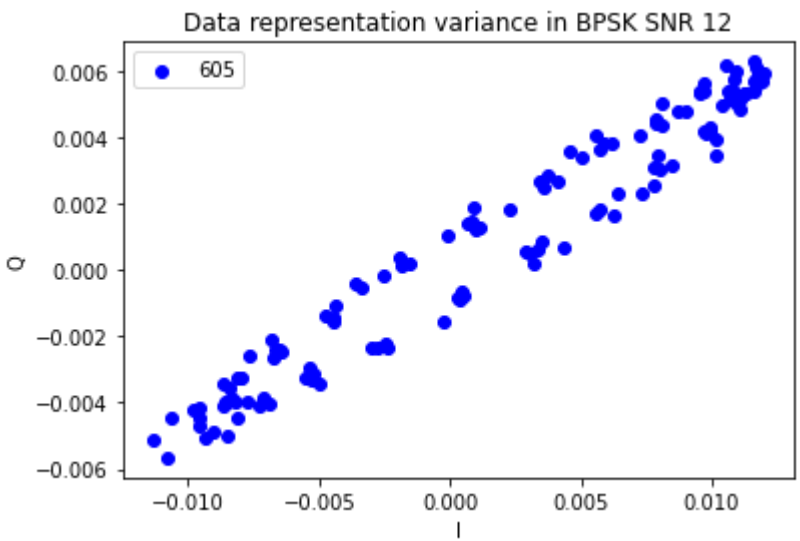
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0.000
−0.002
−0.004
−0.006
Q
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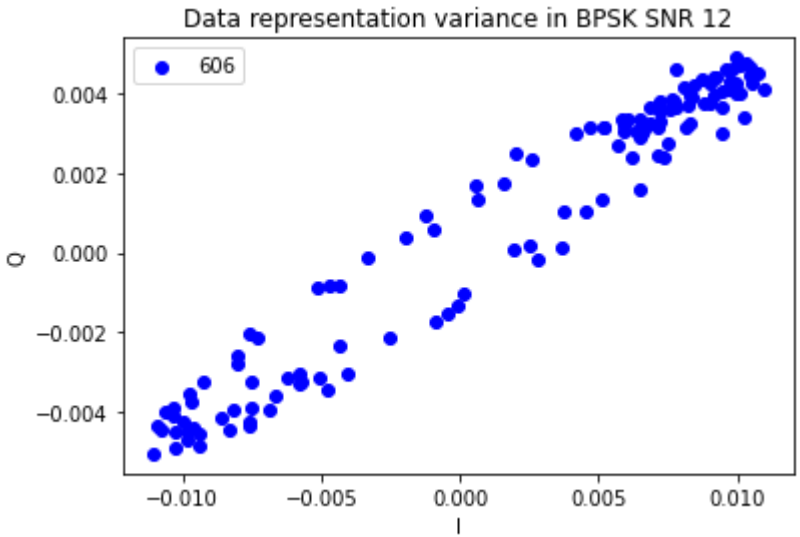
Data representation variance in BPSK SNR 12
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0.002
0.000
−0.002
−0.004
Q
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−0.005
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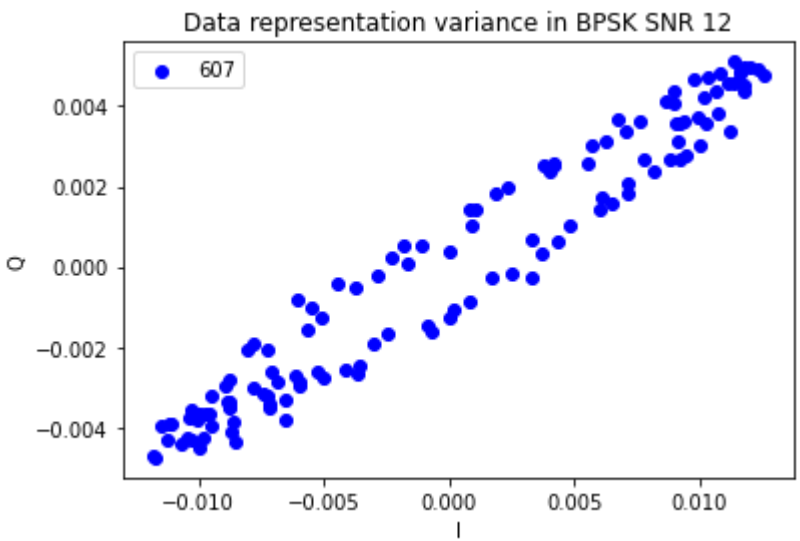
0.010
I


Data representation variance in BPSK SNR 12
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0.002
0.000
−0.002
−0.004
Q
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−0.005
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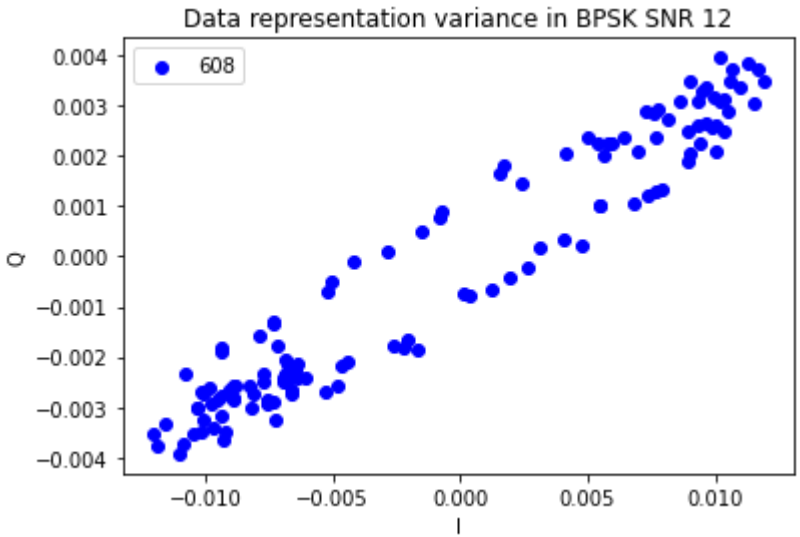
Data representation variance in BPSK SNR 12
608
0.004
0.003
0.002
0.001
0.000
−0.001
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−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
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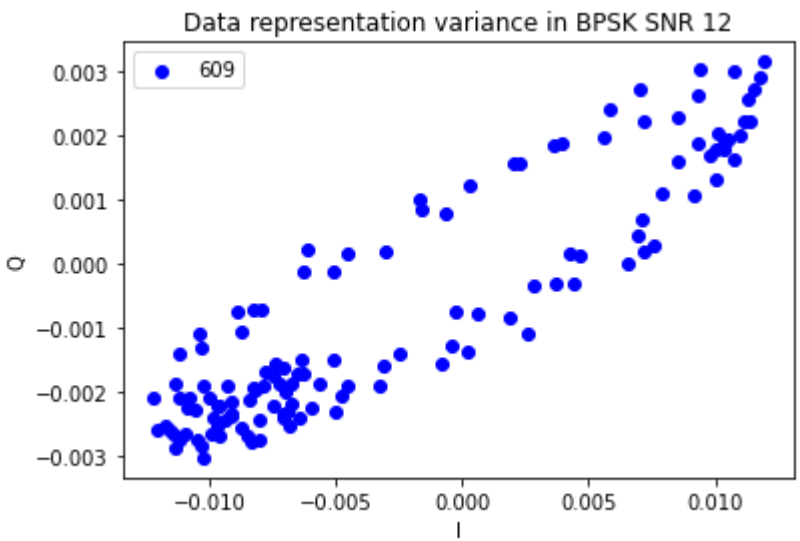
Data representation variance in BPSK SNR 12
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0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
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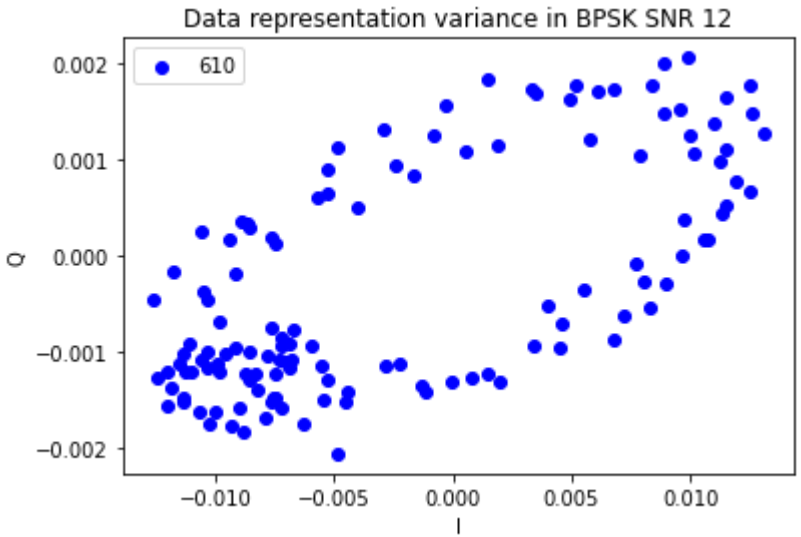
Data representation variance in BPSK SNR 12
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−0.002
Q
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0.005
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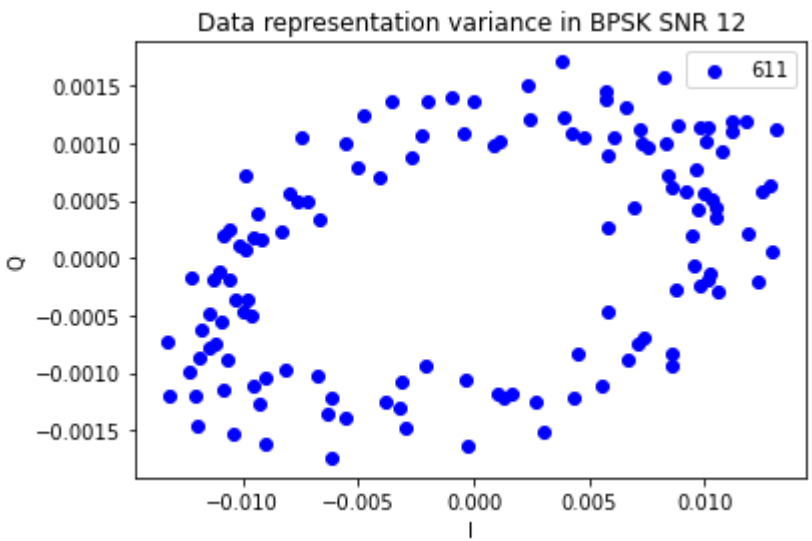
Data representation variance in BPSK SNR 12
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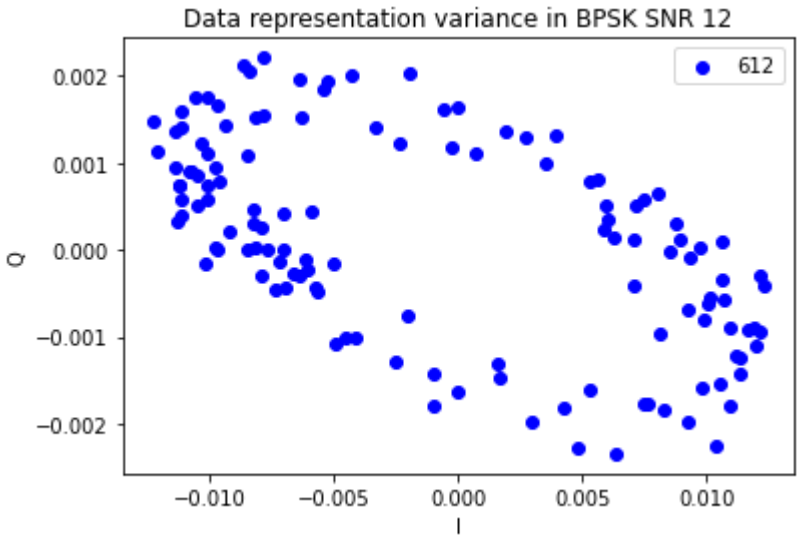
Data representation variance in BPSK SNR 12
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0.000
−0.001
−0.002
Q
−0.010
−0.005
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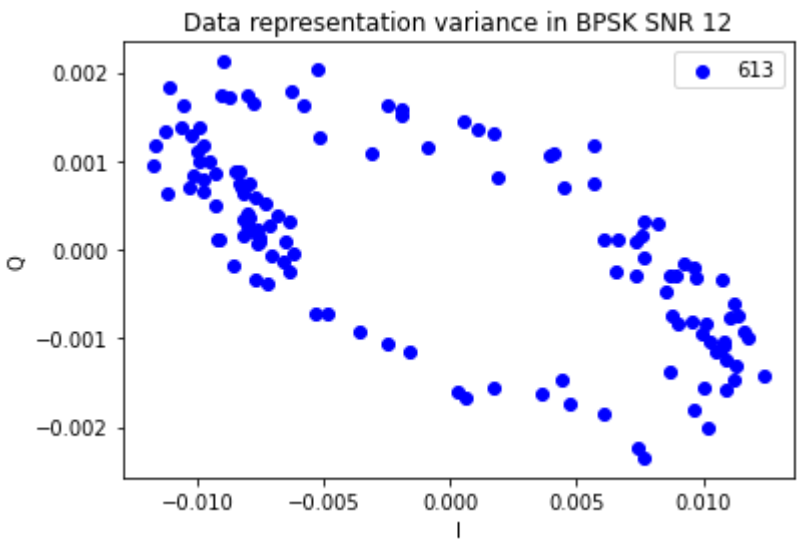
Data representation variance in BPSK SNR 12
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−0.001
−0.002
Q
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−0.005
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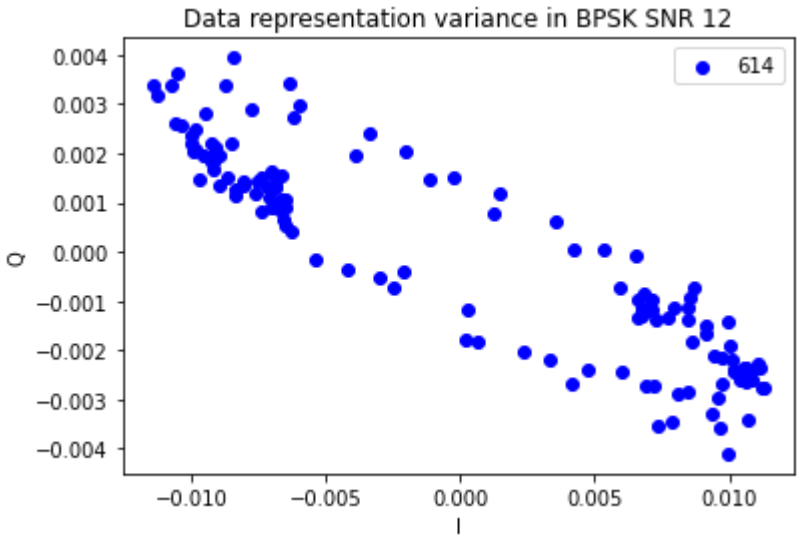
I


Data representation variance in BPSK SNR 12
614
0.004
0.003
0.002
0.001
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−0.004
Q
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−0.005
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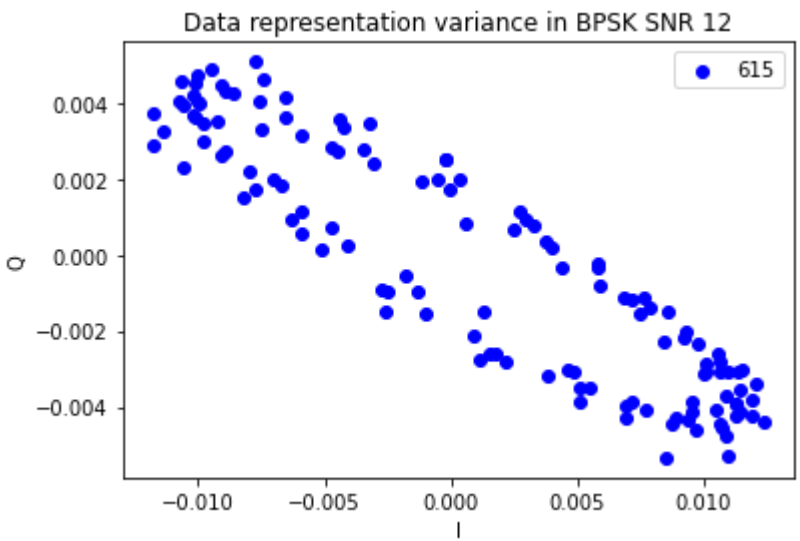
Data representation variance in BPSK SNR 12
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0.004
0.002
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−0.002
−0.004
Q
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−0.005
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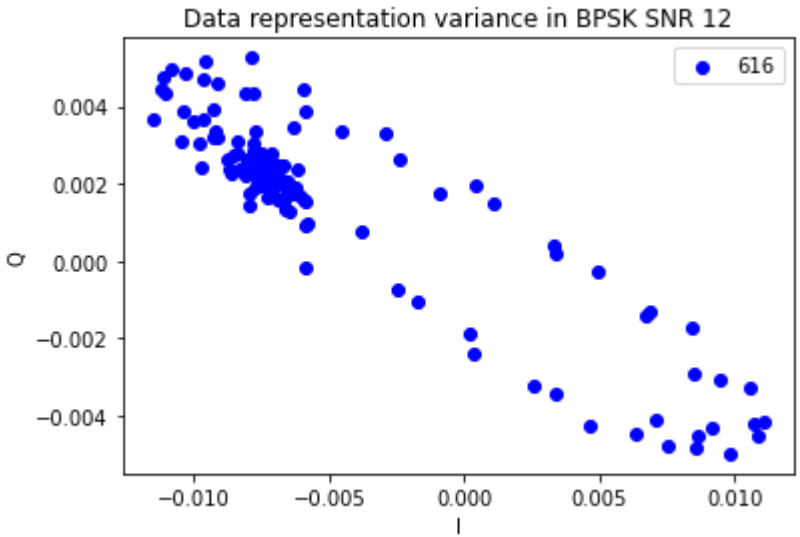
Data representation variance in BPSK SNR 12
616
0.004
0.002
0.000
−0.002
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Q
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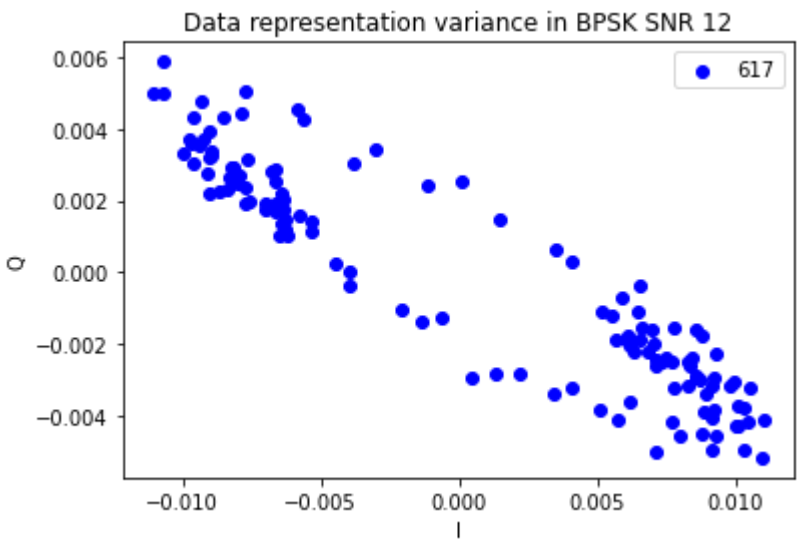
Data representation variance in BPSK SNR 12
617
0.006
0.004
0.002
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Q
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−0.005
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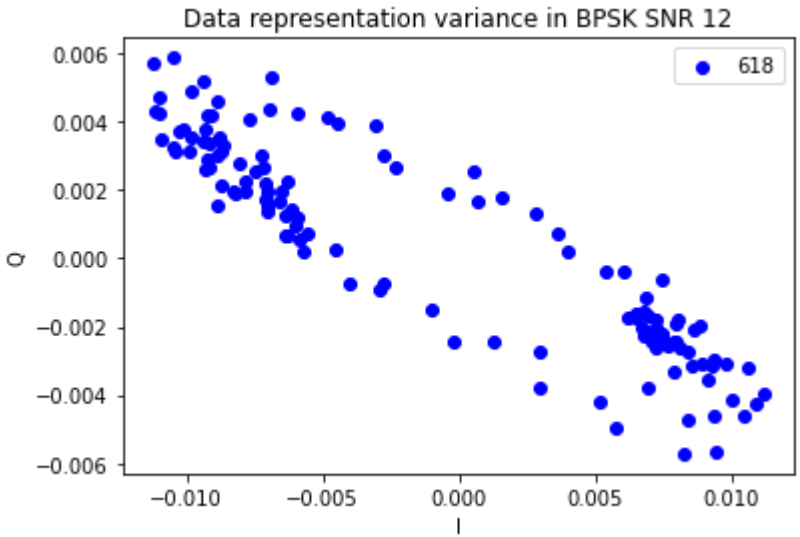
Data representation variance in BPSK SNR 12
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0.006
0.004
0.002
0.000
−0.002
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−0.006
Q
−0.010
−0.005
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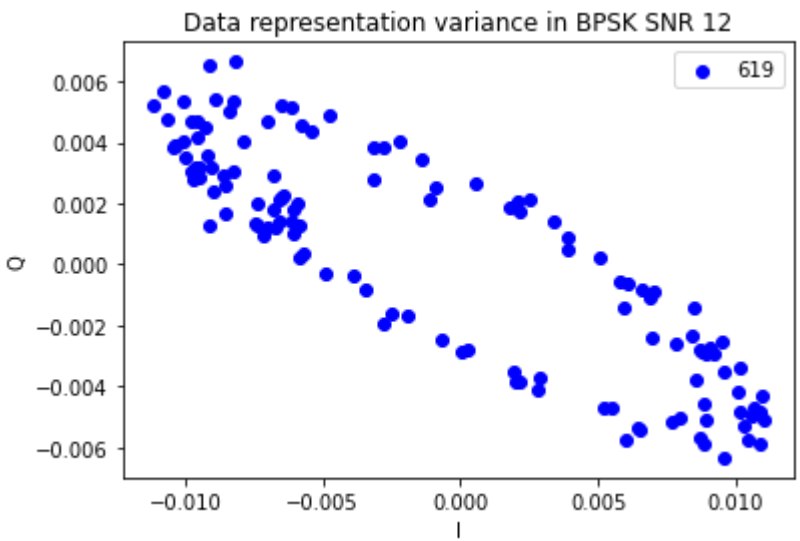
Data representation variance in BPSK SNR 12
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0.004
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0.000
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Q
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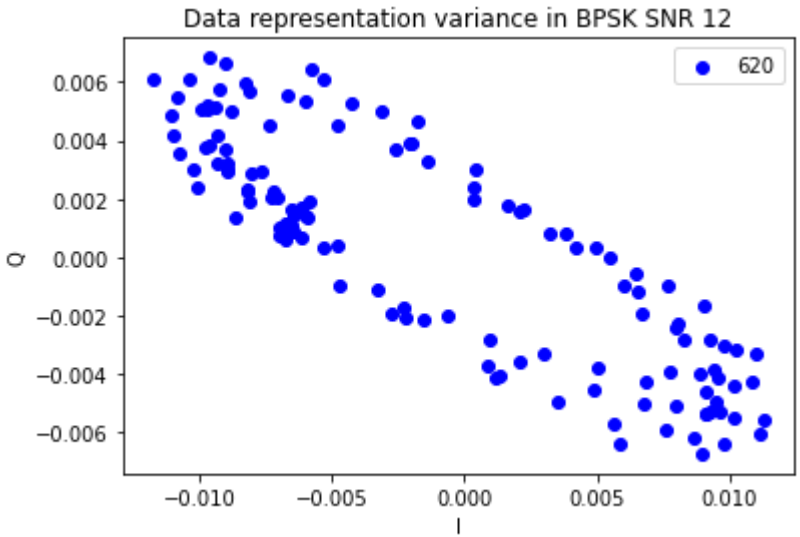
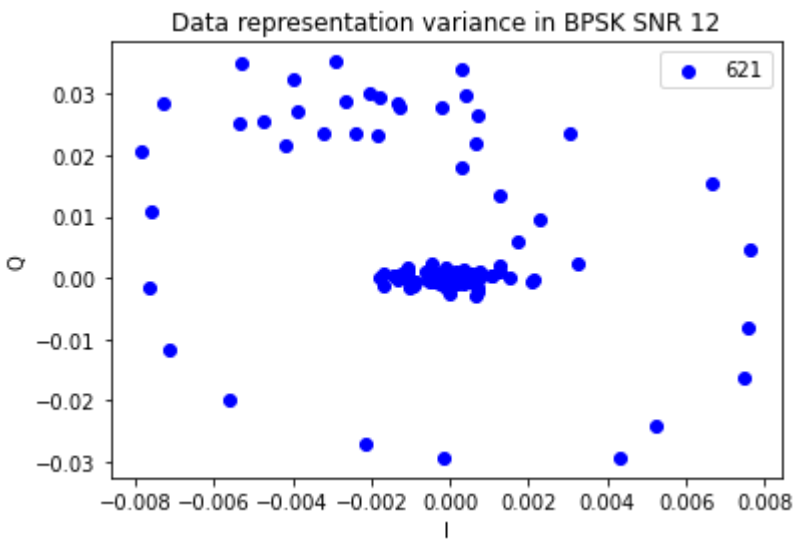
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
620
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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0.02
0.01
0.00
−0.01
−0.02
−0.03
Q
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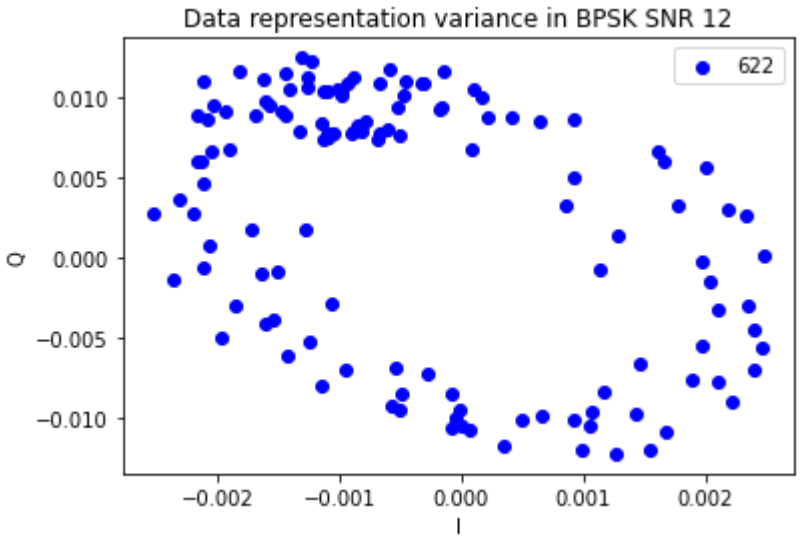
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I


Data representation variance in BPSK SNR 12
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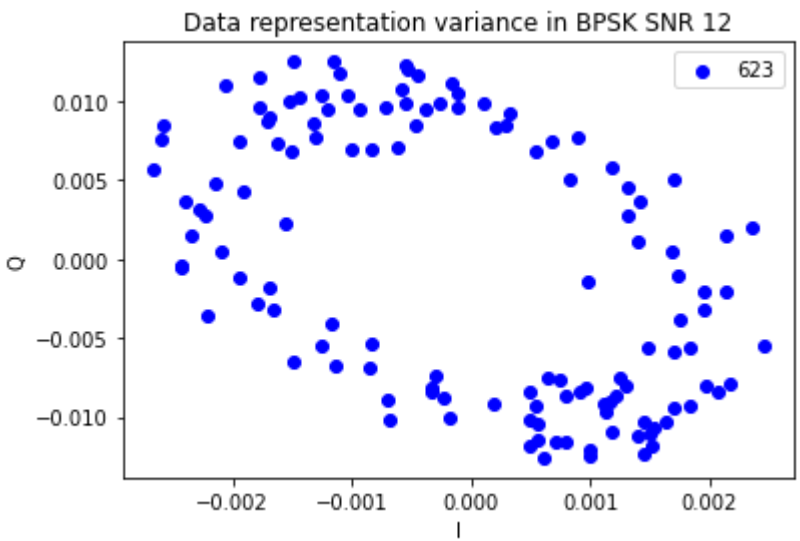
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
623
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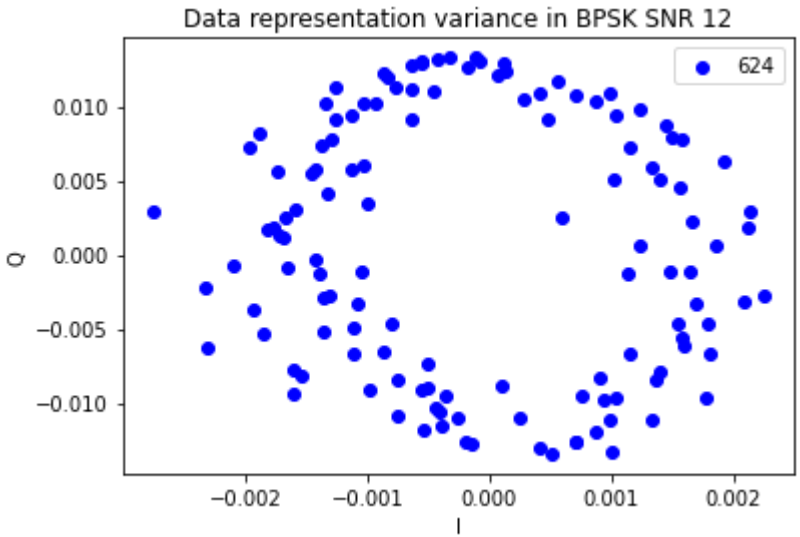
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
624
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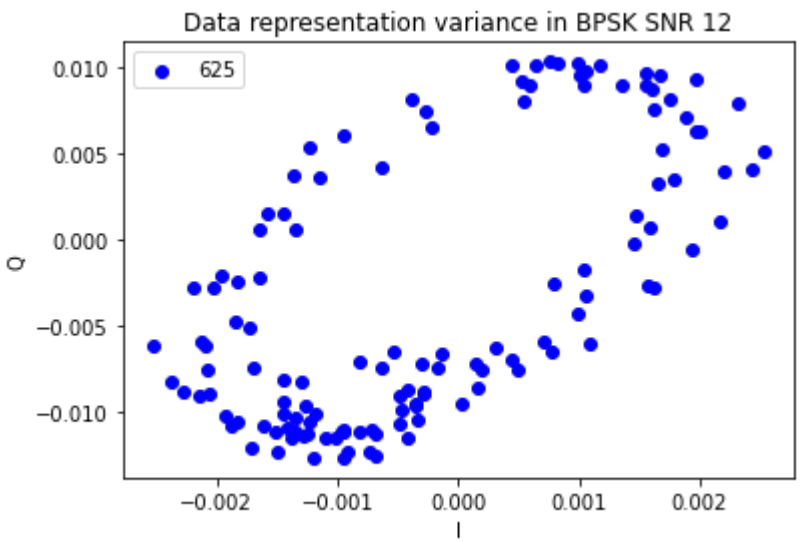
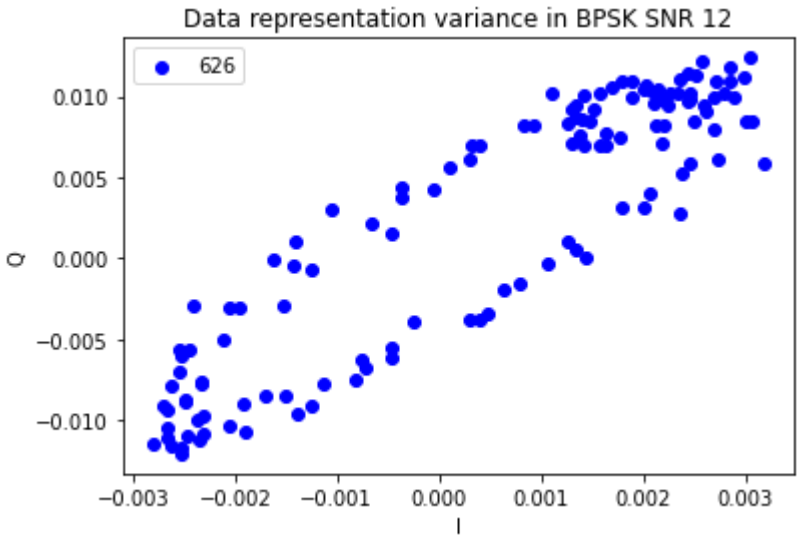
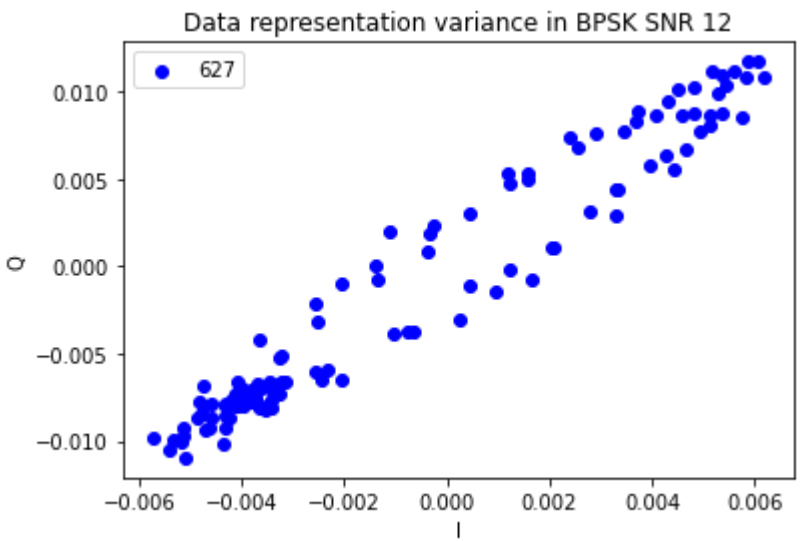
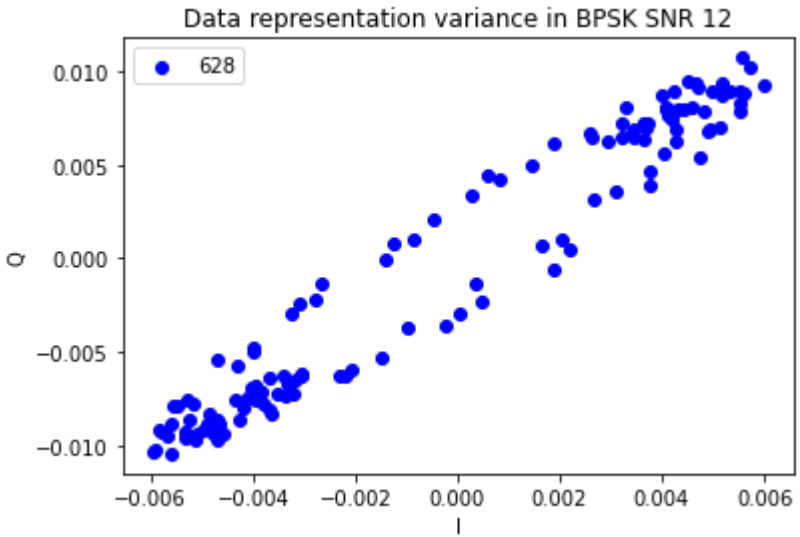
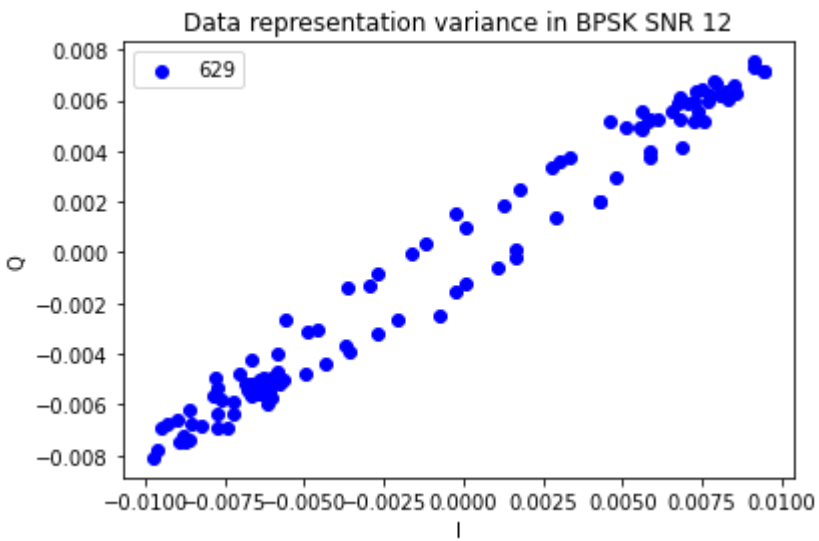
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
625
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
626
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
627
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
628
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
629
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0.006
0.004
0.002
0.000
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−0.004
−0.006
−0.008
Q
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−0.0075
−0.0050
−0.0025
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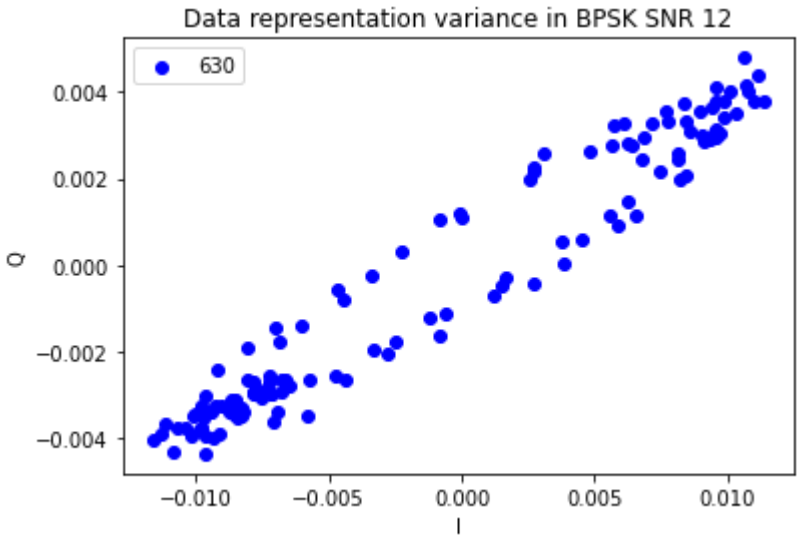
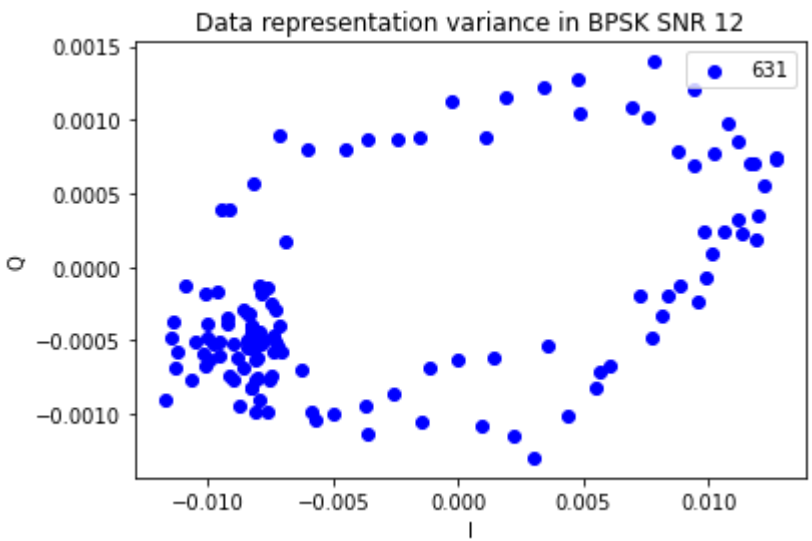
0.0025
0.0050
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
630
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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−0.005
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0.005
0.010
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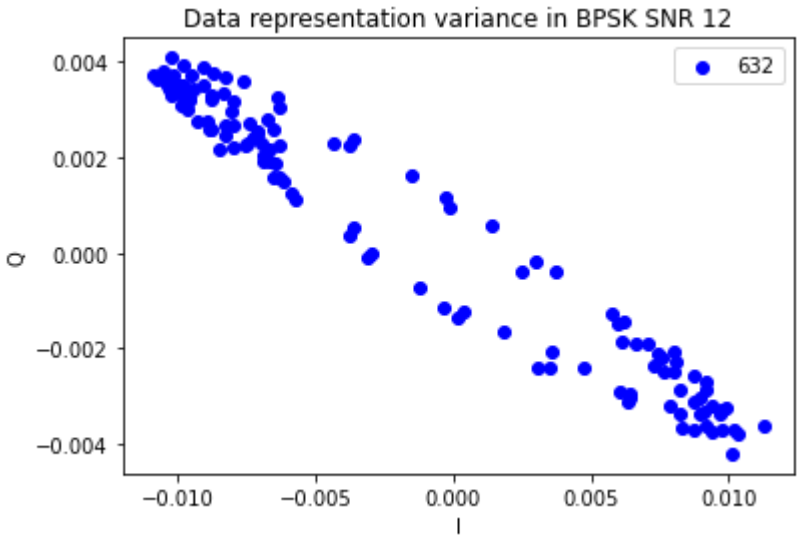
Data representation variance in BPSK SNR 12
632
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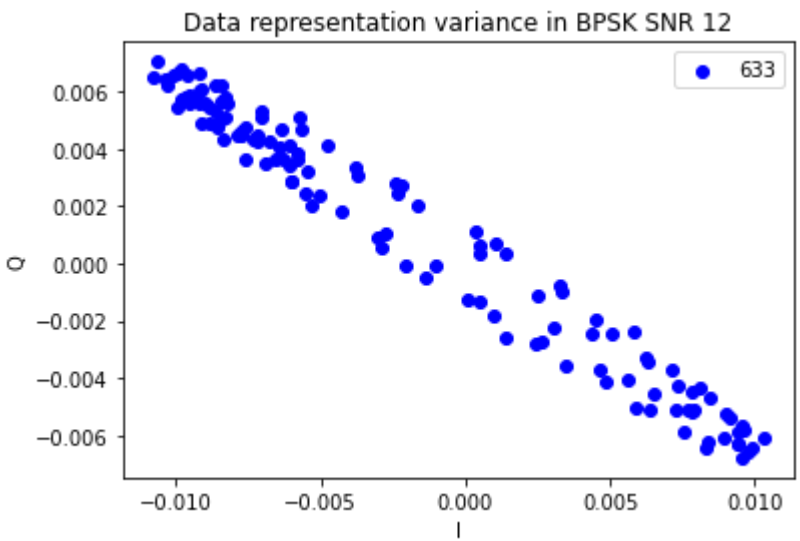
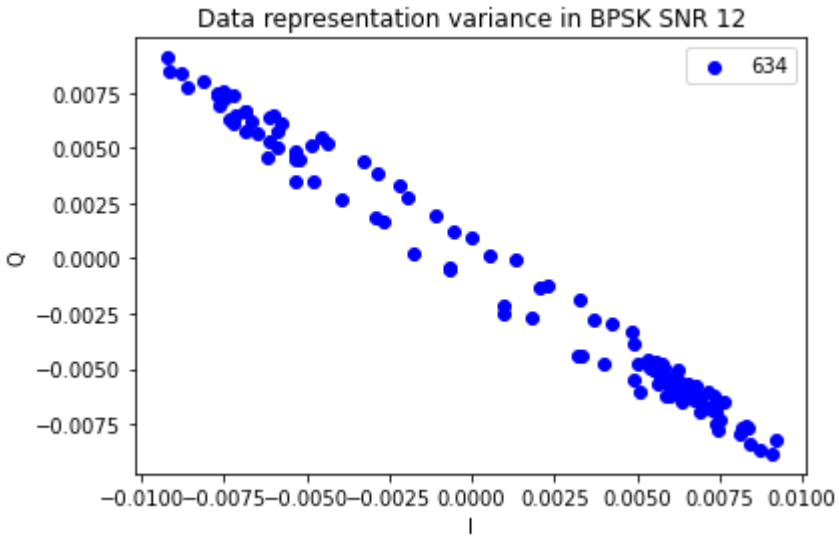
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
633
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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0.0050
0.0025
0.0000
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−0.0075
Q
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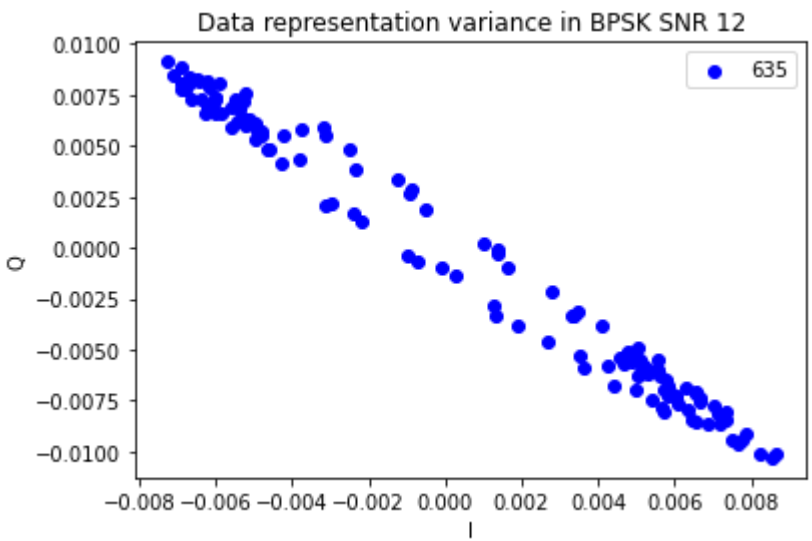
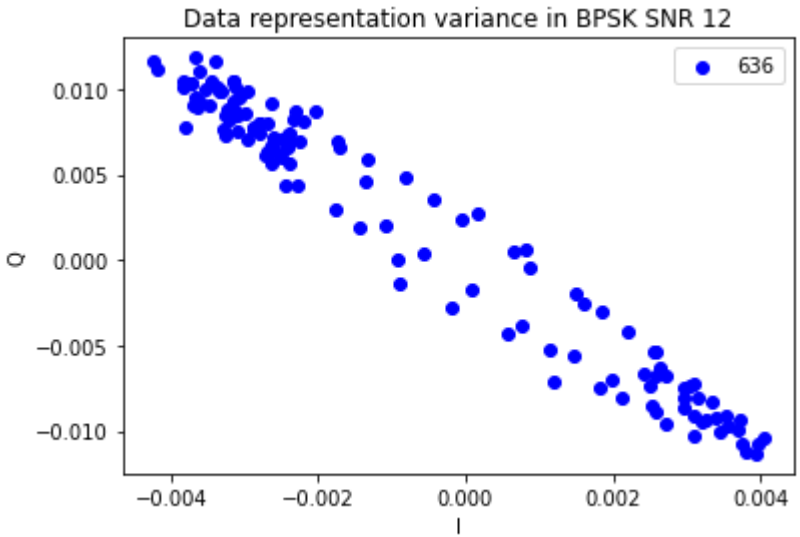

Data representation variance in BPSK SNR 12
635
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
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0.000
−0.005
−0.010
Q
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−0.002
0.000
0.002
0.004
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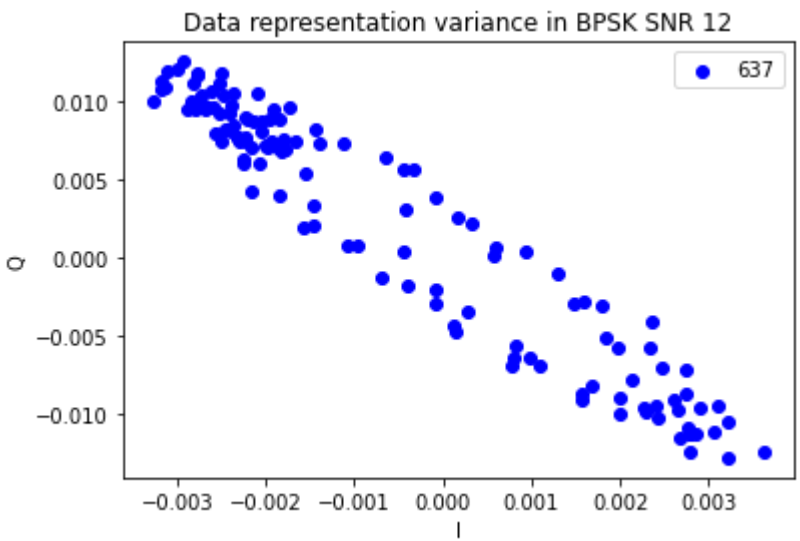
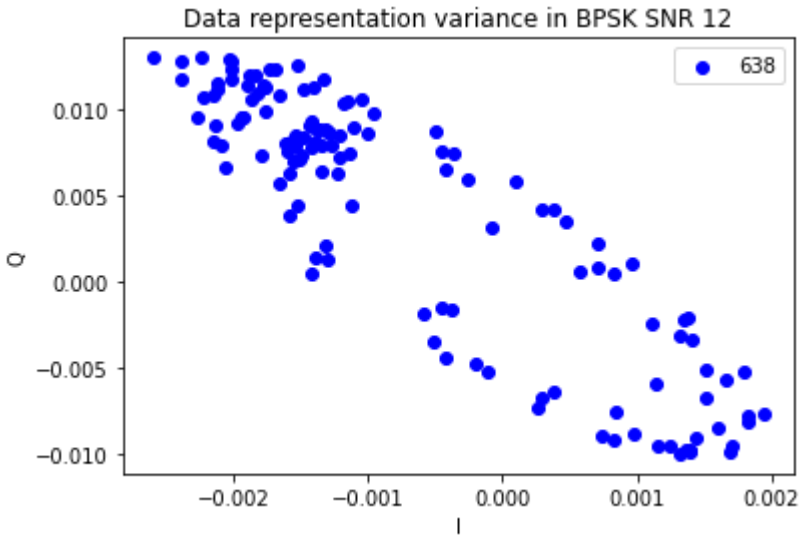

Data representation variance in BPSK SNR 12
637
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
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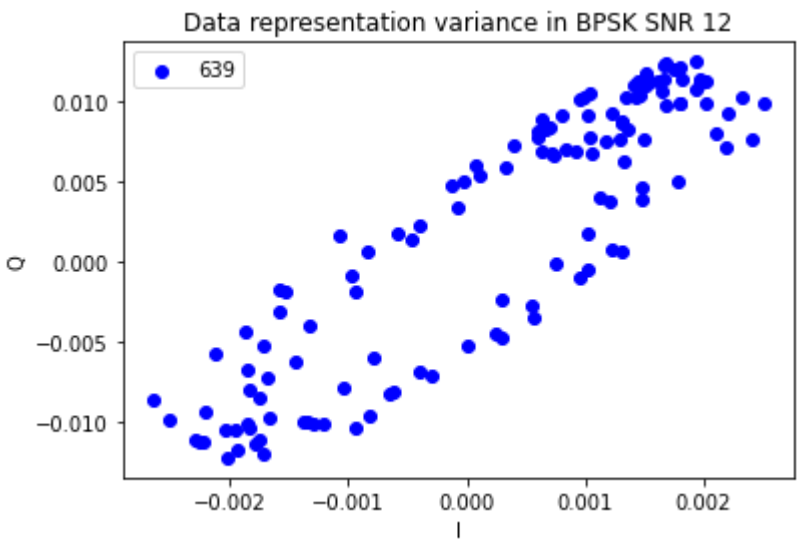
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
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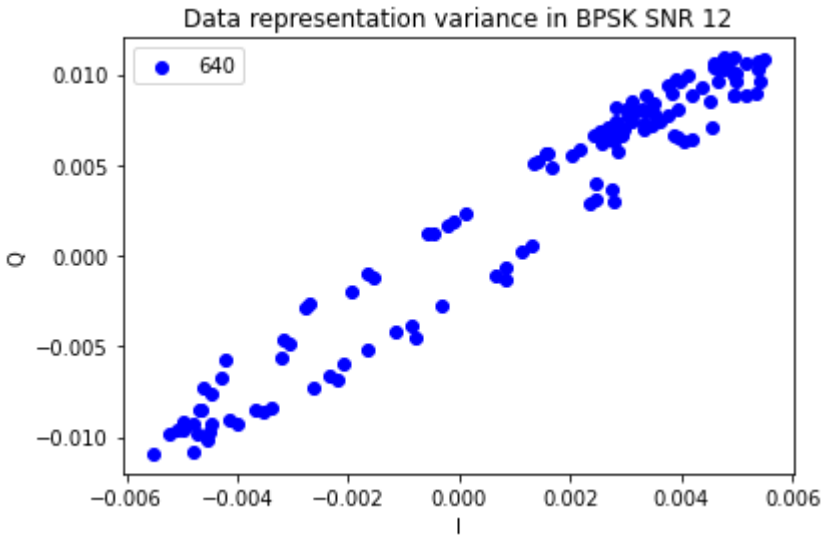
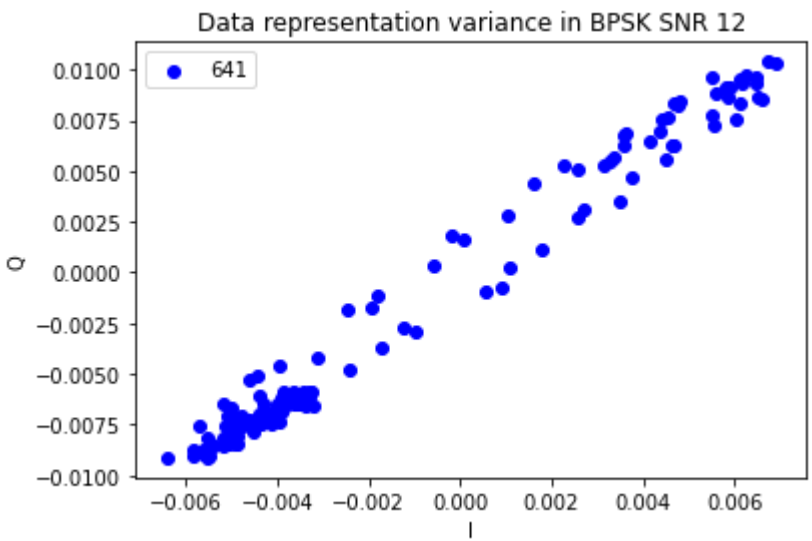
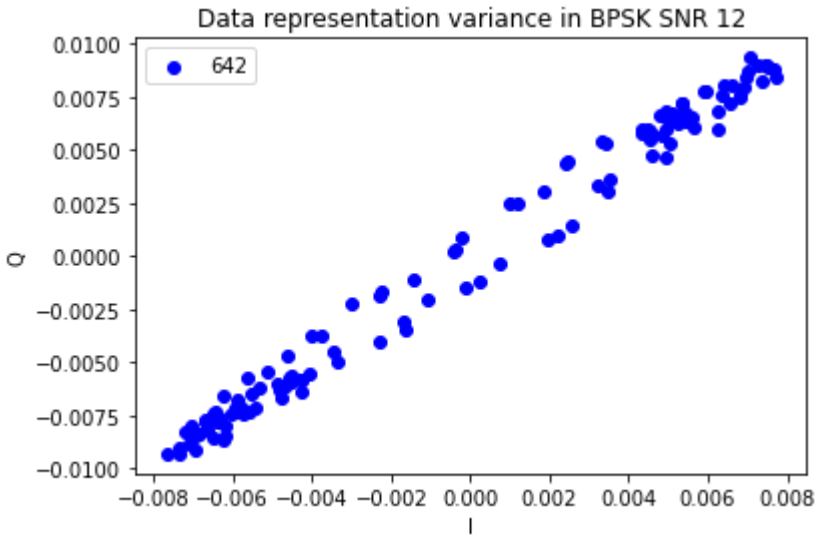
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
640
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
641
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
642
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
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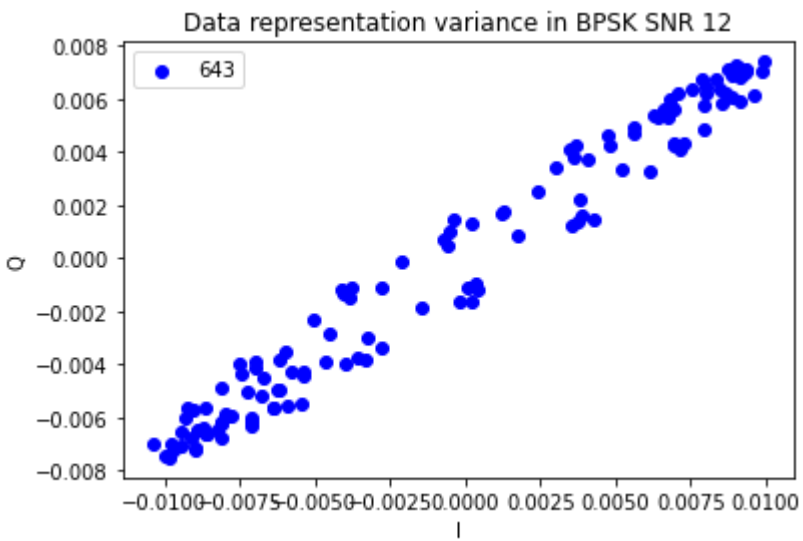
I


Data representation variance in BPSK SNR 12
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0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
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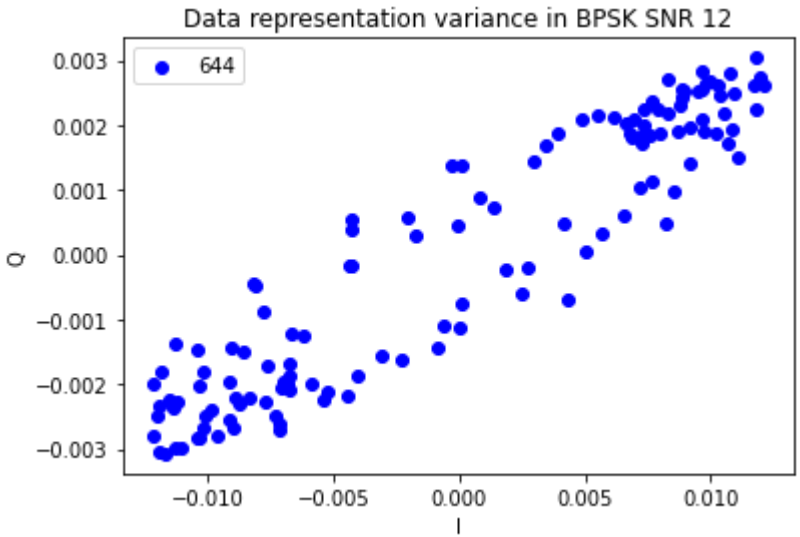
I


Data representation variance in BPSK SNR 12
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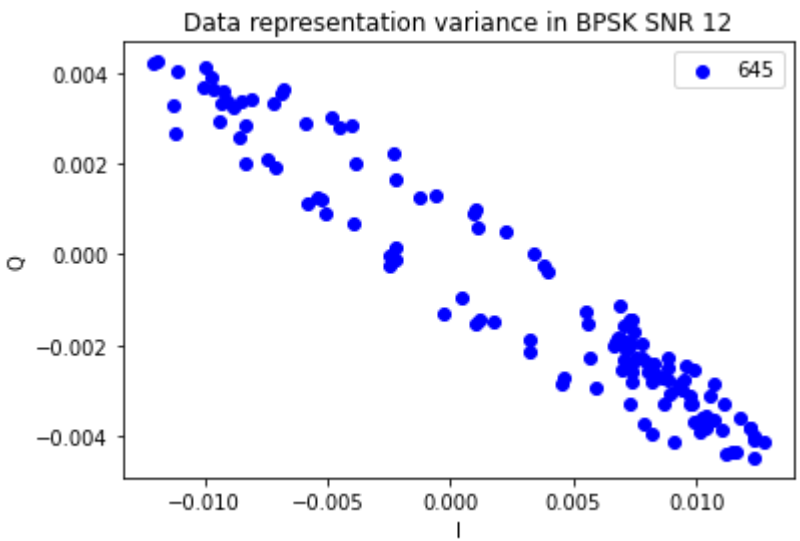
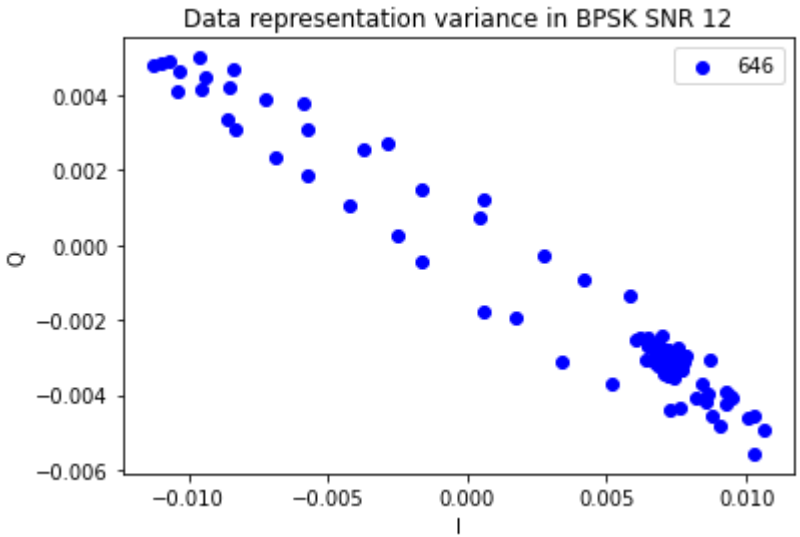
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
645
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
646
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
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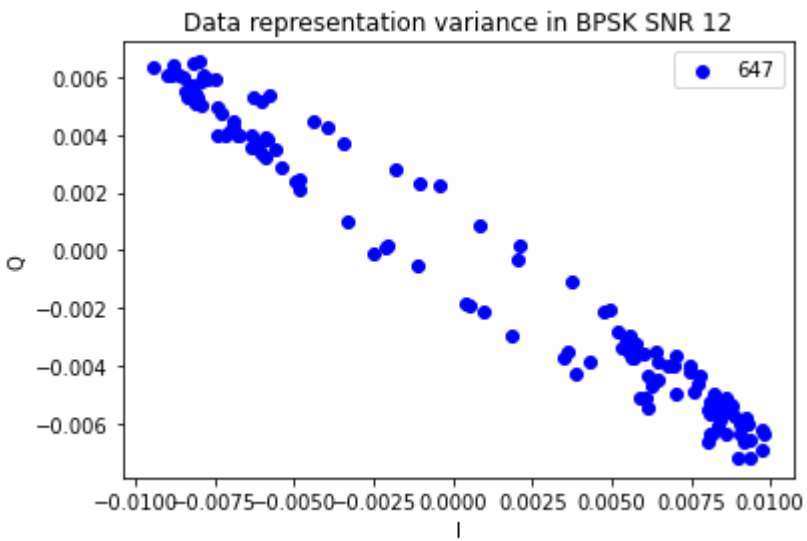
Data representation variance in BPSK SNR 12
647
0.006
0.004
0.002
0.000
−0.002
−0.004
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Q
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−0.0075
−0.0050
−0.0025
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0.0025
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0.0075
0.0100
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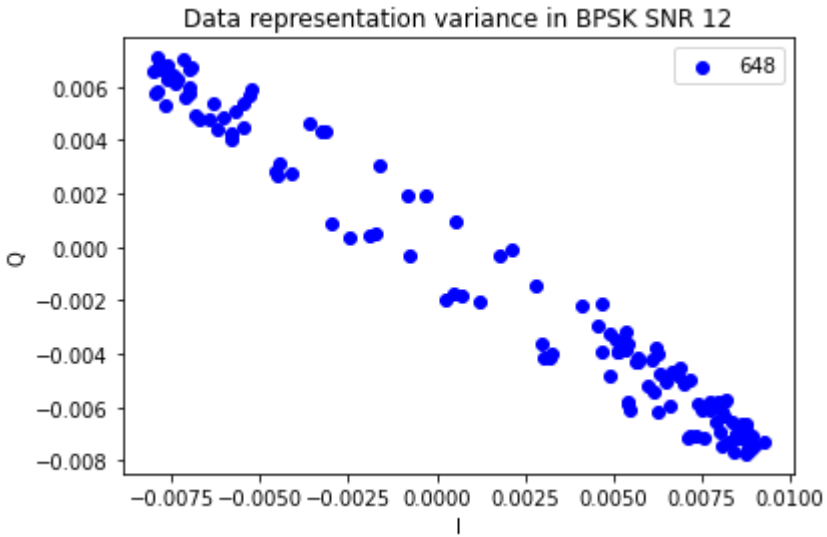
Data representation variance in BPSK SNR 12
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0.006
0.004
0.002
0.000
−0.002
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−0.006
−0.008
Q
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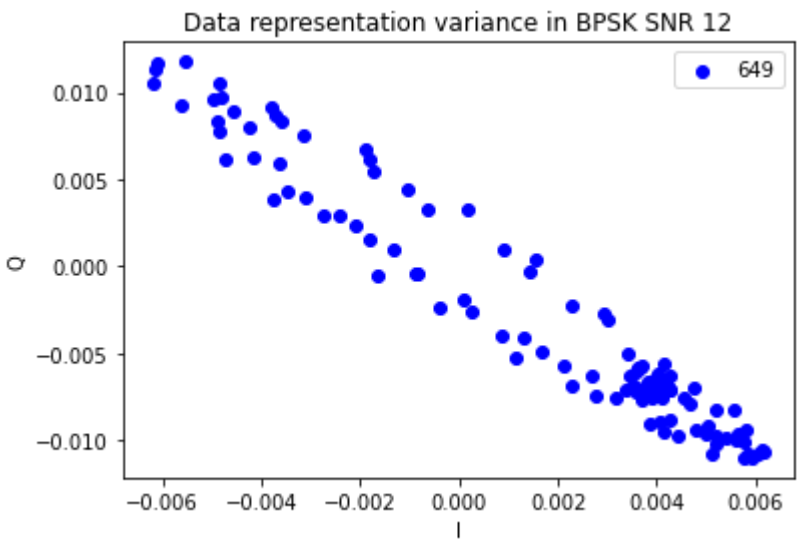
Data representation variance in BPSK SNR 12
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0.000
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−0.010
Q
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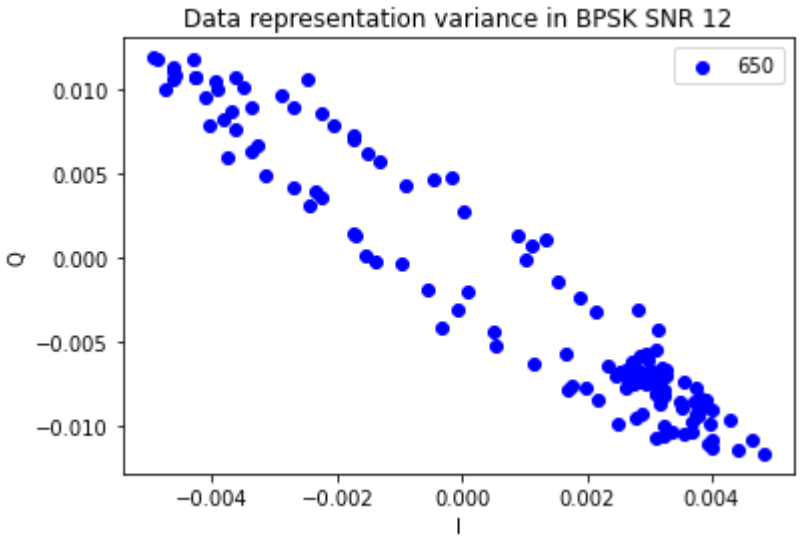
Data representation variance in BPSK SNR 12
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−0.005
−0.010
Q
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0.002
0.004
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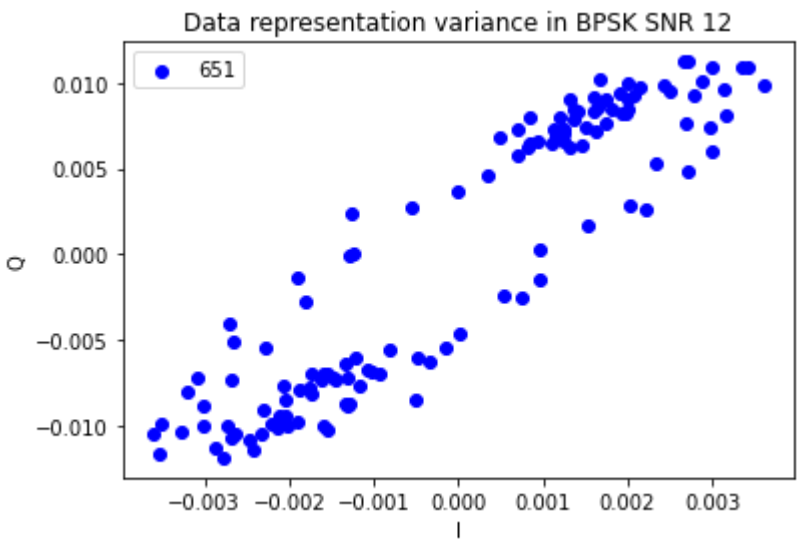
Data representation variance in BPSK SNR 12
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0.010
0.005
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Q
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−0.002
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0.002
0.003
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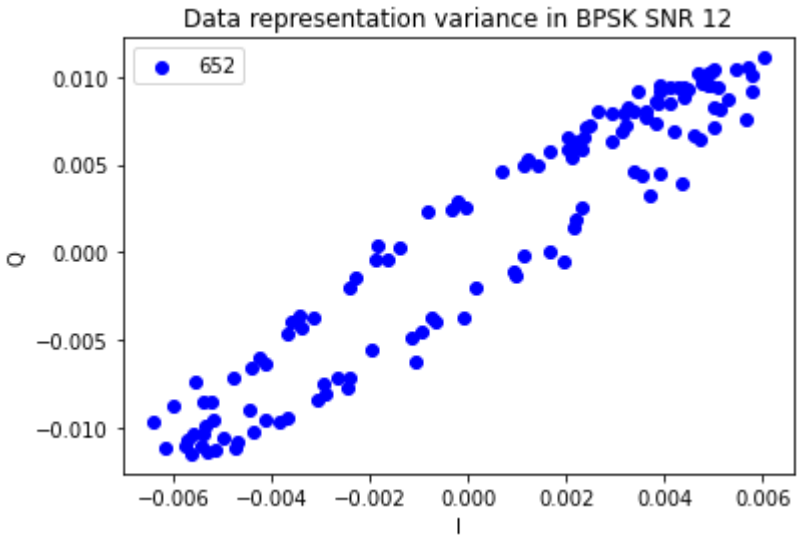
Data representation variance in BPSK SNR 12
652
0.010
0.005
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−0.005
−0.010
Q
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−0.004
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0.004
0.006
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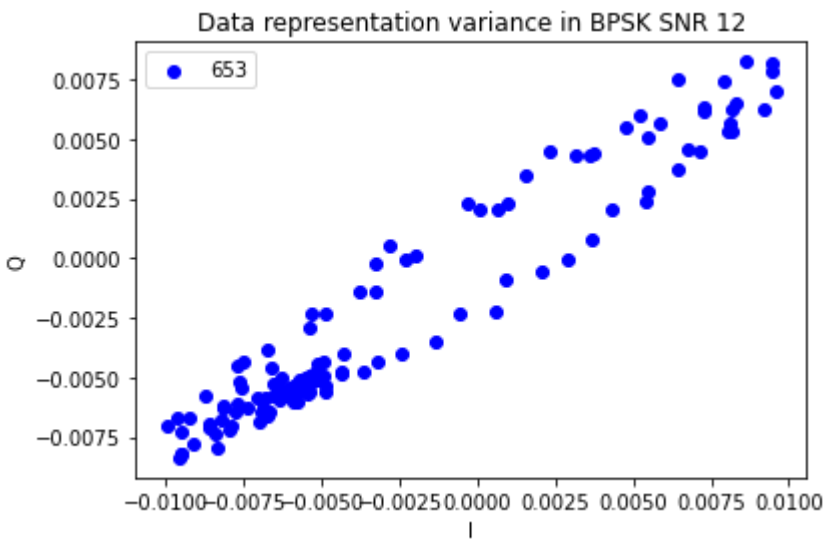
Data representation variance in BPSK SNR 12
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0.0050
0.0025
0.0000
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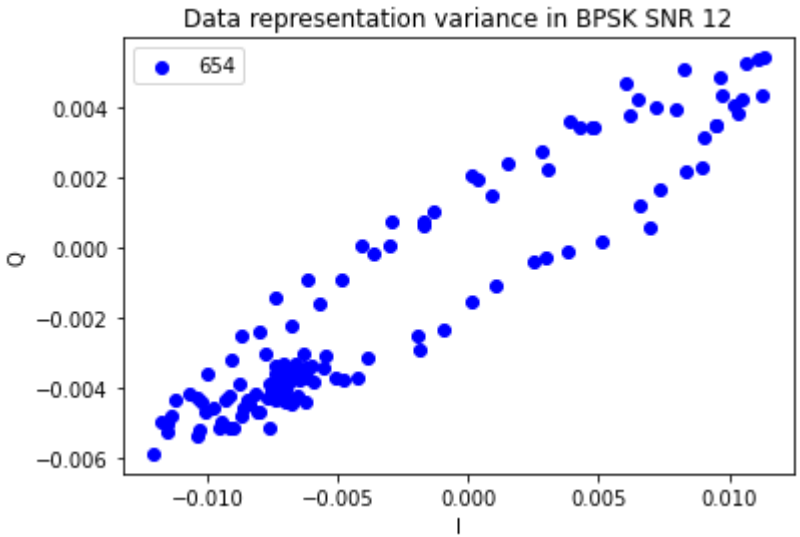
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
654
0.004
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0.000
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−0.006
Q
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−0.005
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0.005
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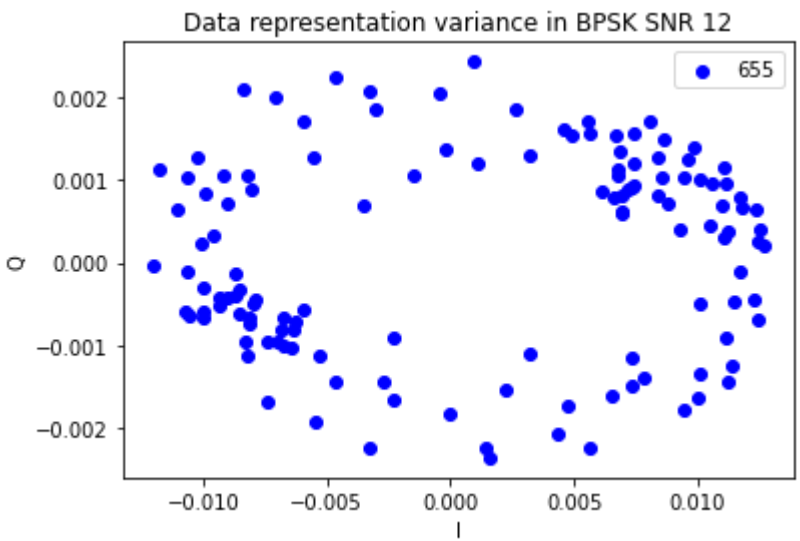
Data representation variance in BPSK SNR 12
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0.002
0.001
0.000
−0.001
−0.002
Q
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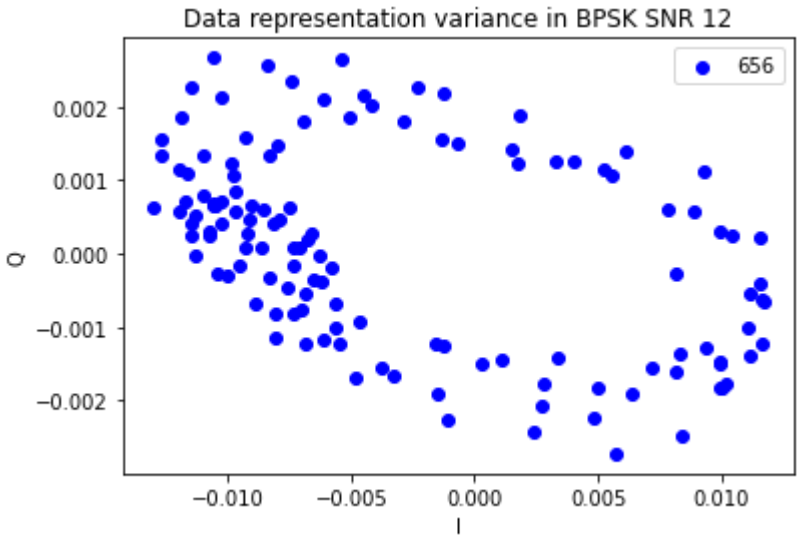
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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0.002
0.001
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−0.002
Q
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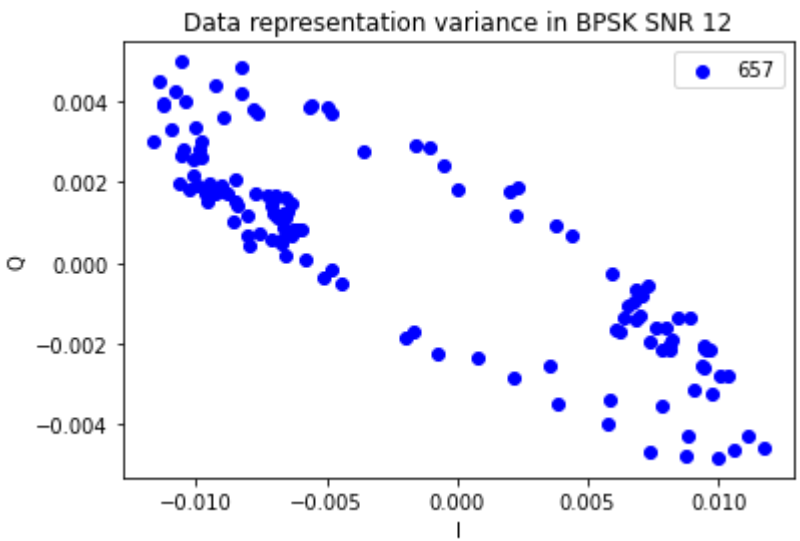
Data representation variance in BPSK SNR 12
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−0.002
−0.004
Q
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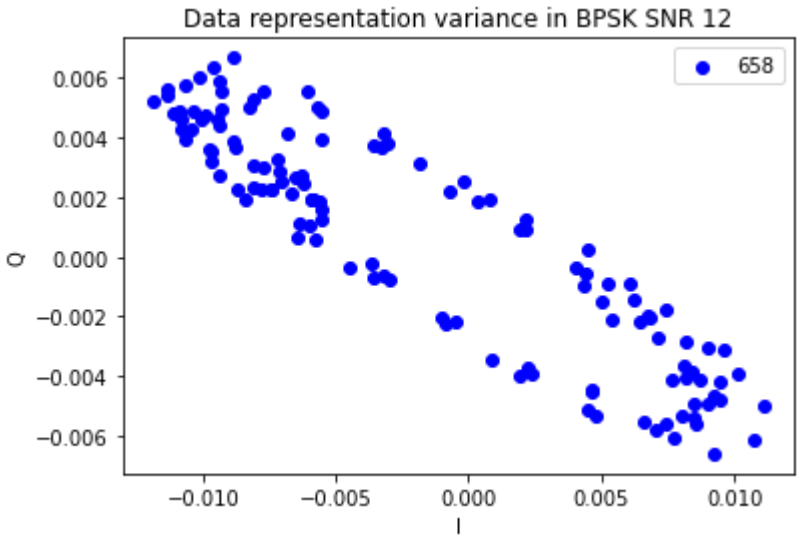
0.005
0.010
I


Data representation variance in BPSK SNR 12
658
0.006
0.004
0.002
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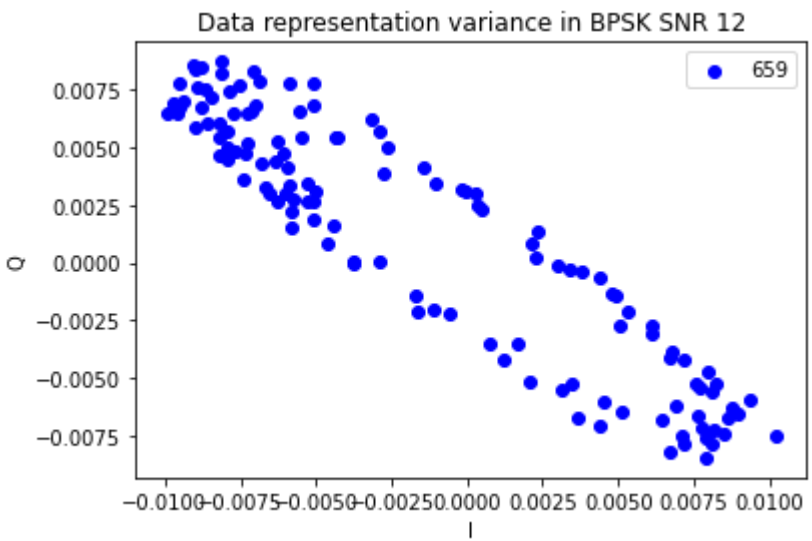
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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0.0050
0.0025
0.0000
−0.0025
−0.0050
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Q
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−0.0075
−0.0050
−0.0025
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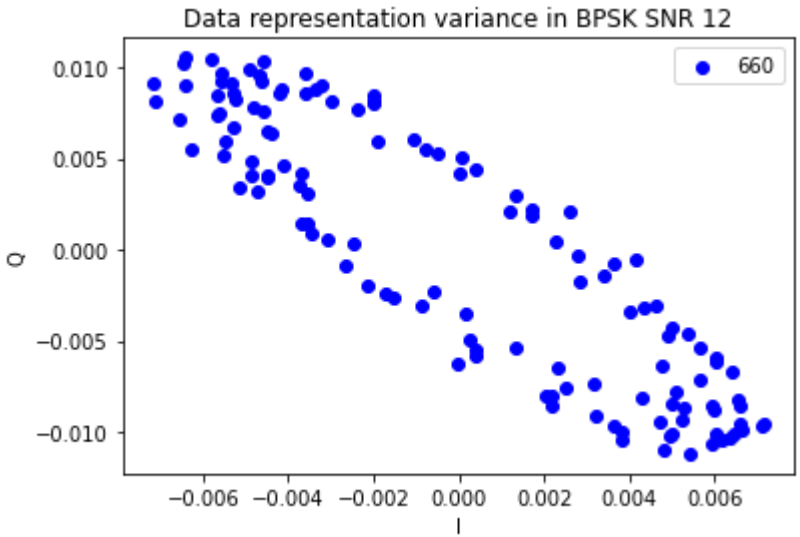
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
660
0.010
0.005
0.000
−0.005
−0.010
Q
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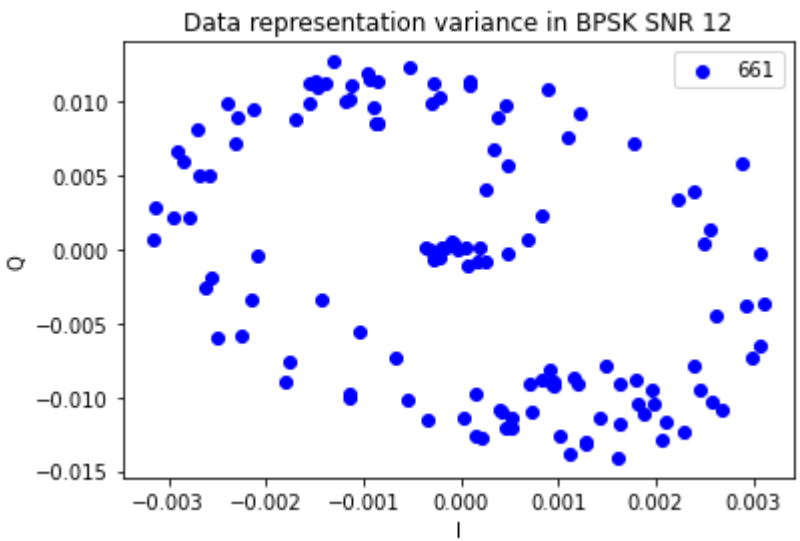
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
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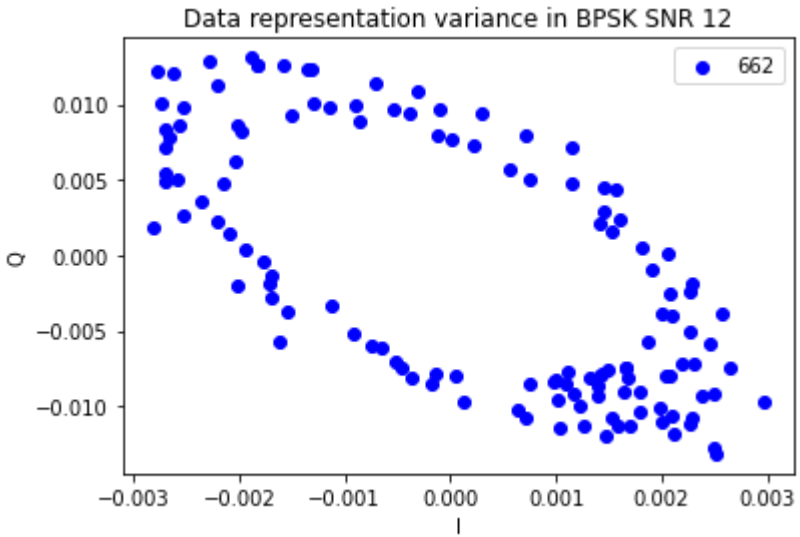
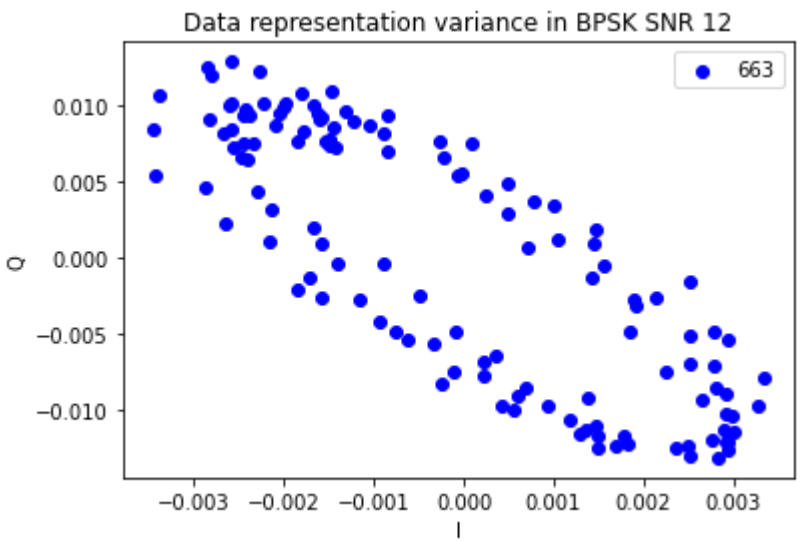
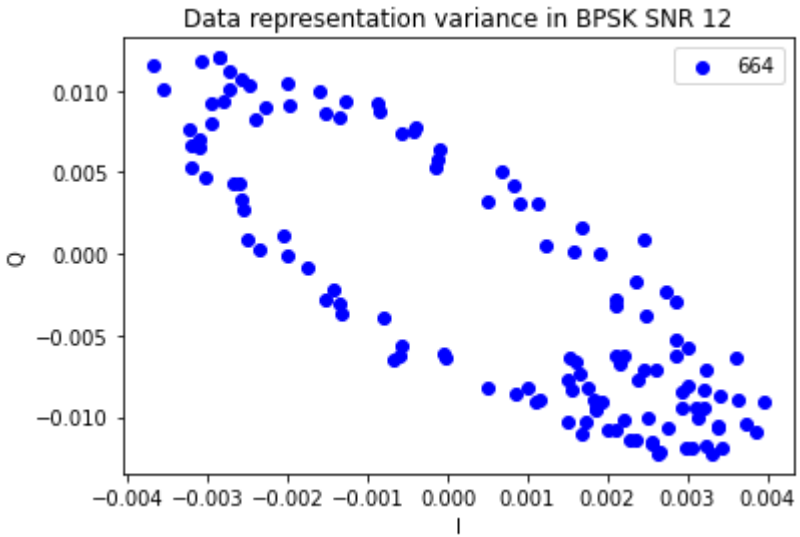
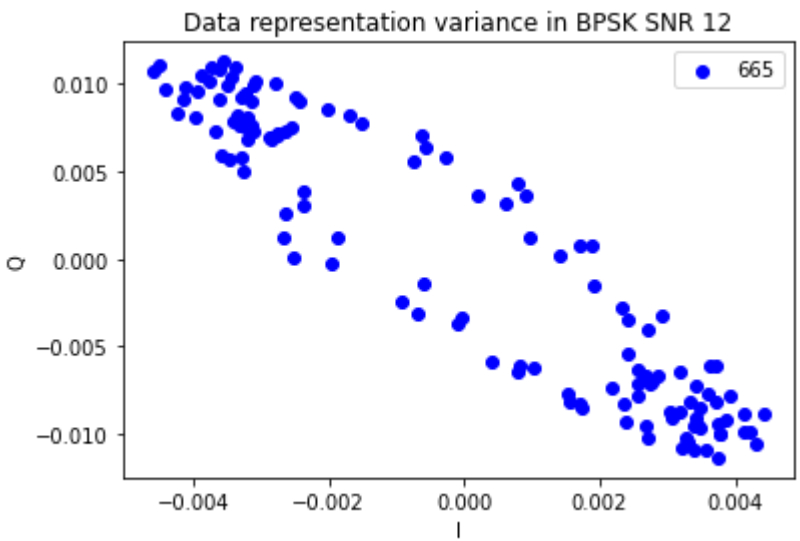
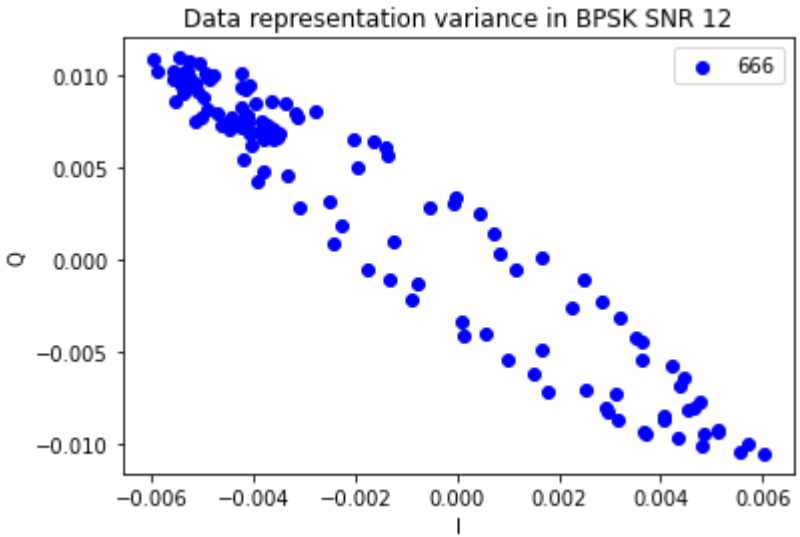
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

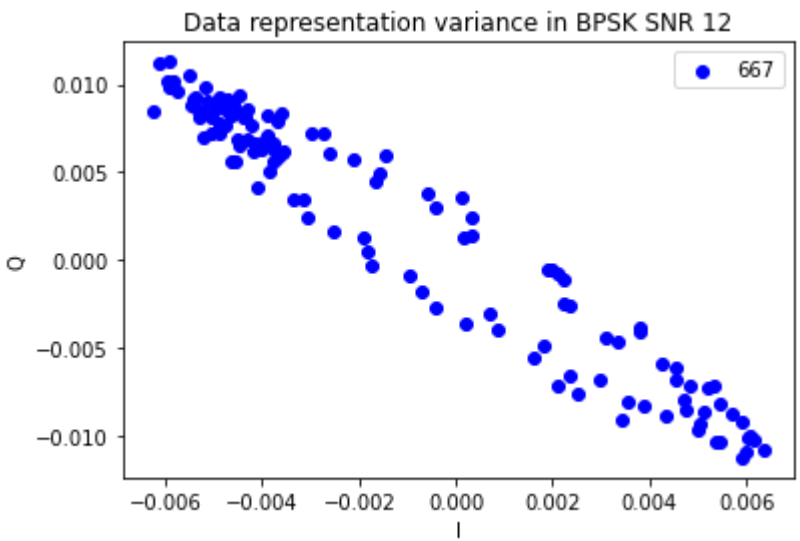

Data representation variance in BPSK SNR 12
662
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

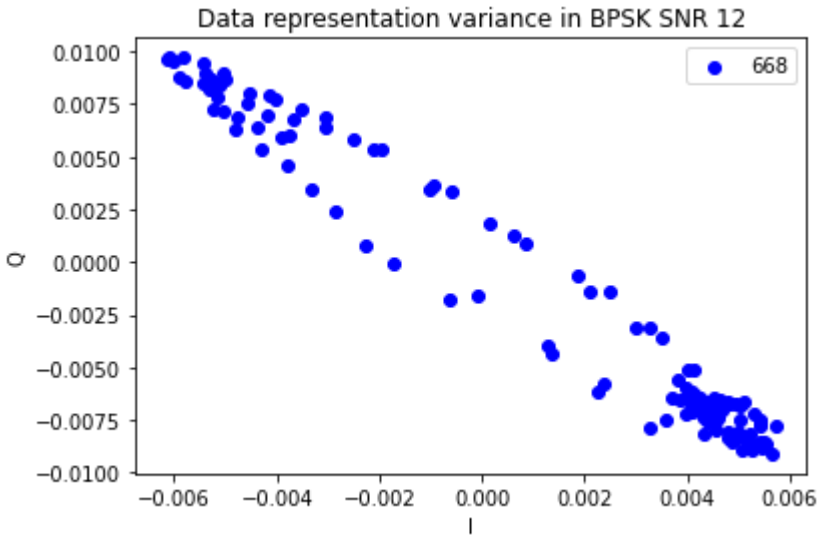

Data representation variance in BPSK SNR 12
663
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

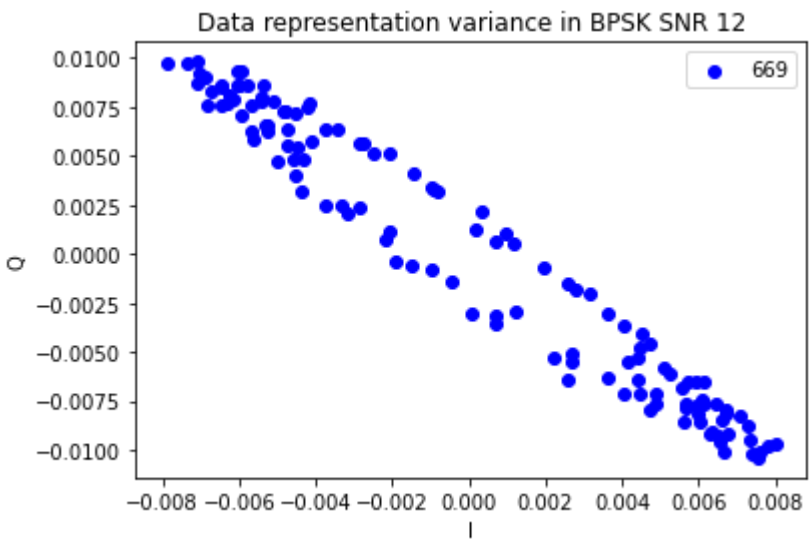

Data representation variance in BPSK SNR 12
664
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
665
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I


Data representation variance in BPSK SNR 12
666
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
667
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
668
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
669
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
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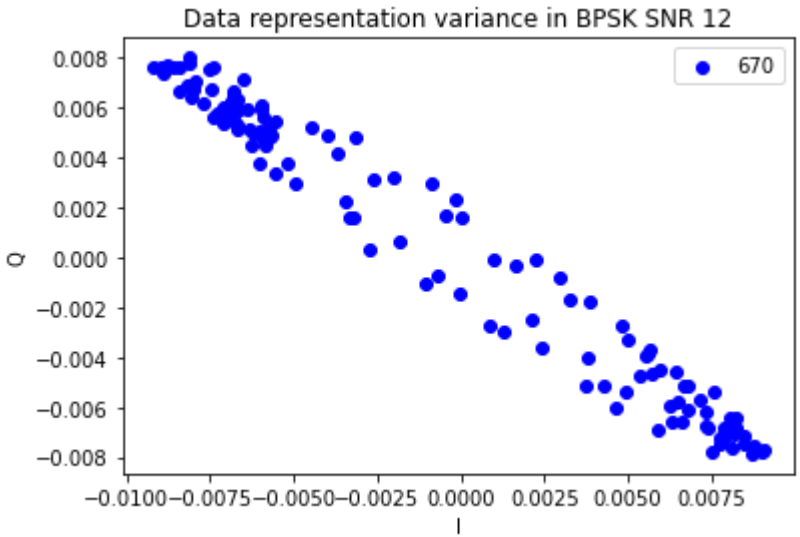
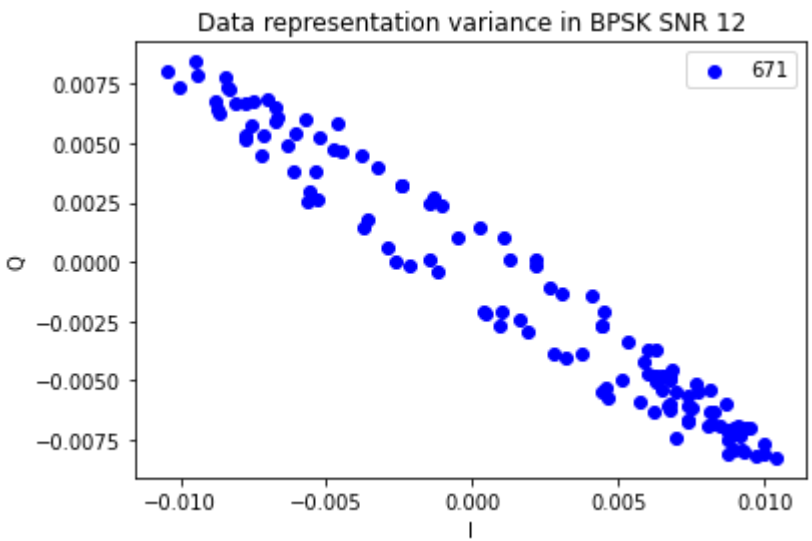
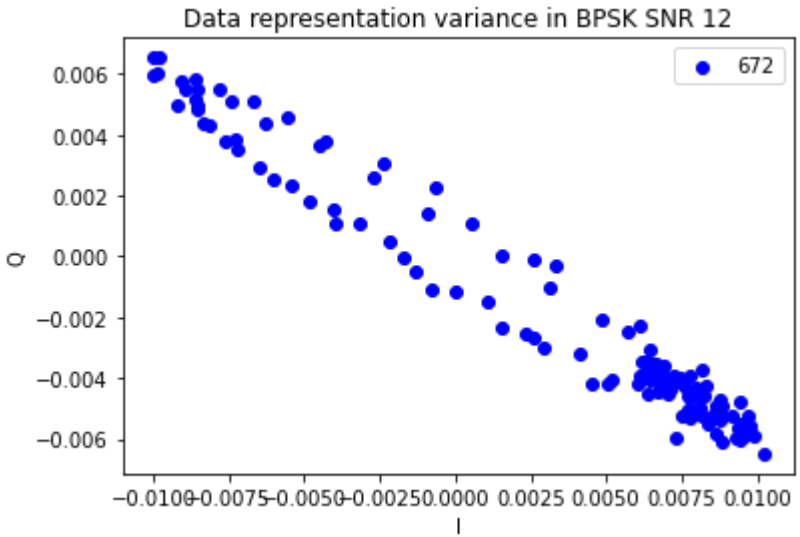
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I


Data representation variance in BPSK SNR 12
670
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
671
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.010 −0.005 0.000 0.005 0.010
I


Data representation variance in BPSK SNR 12
672
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
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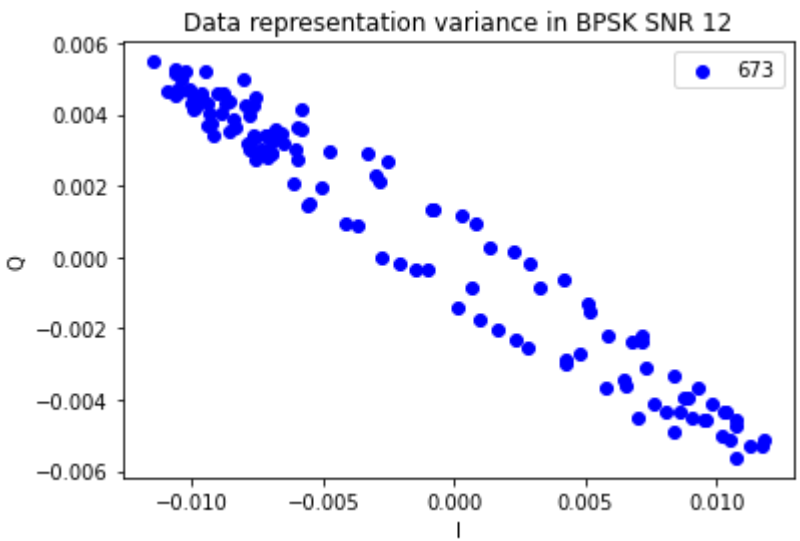
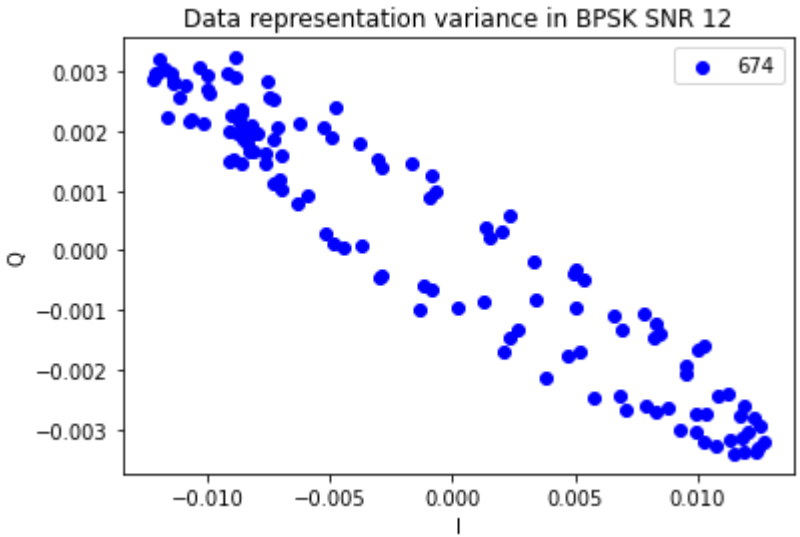
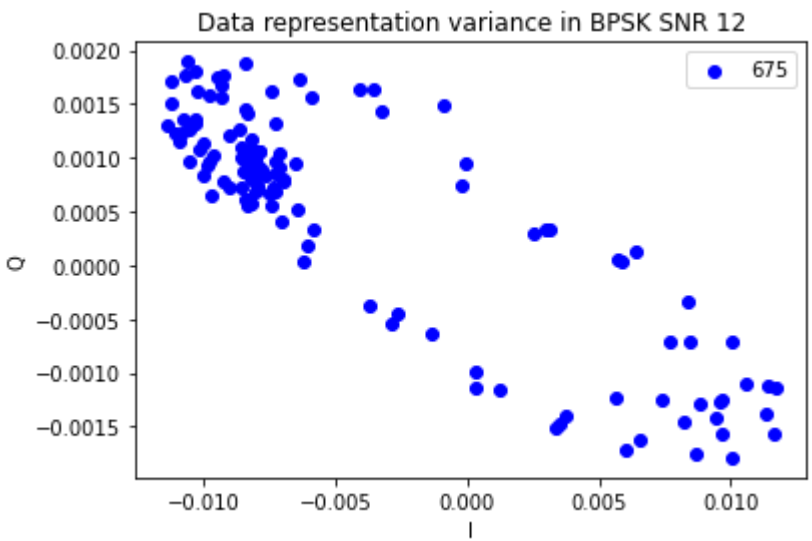
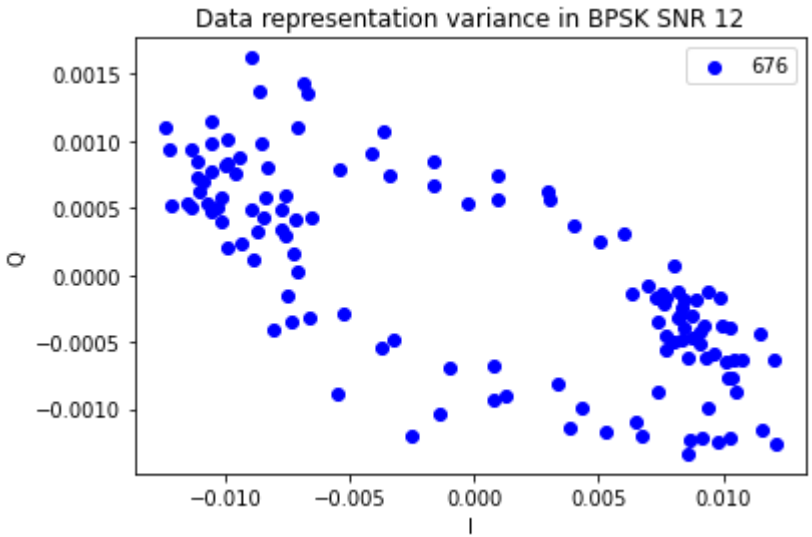
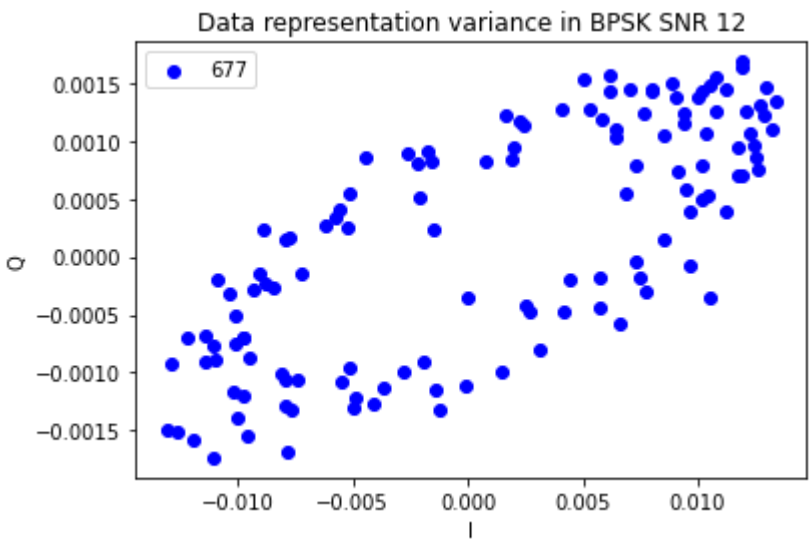
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

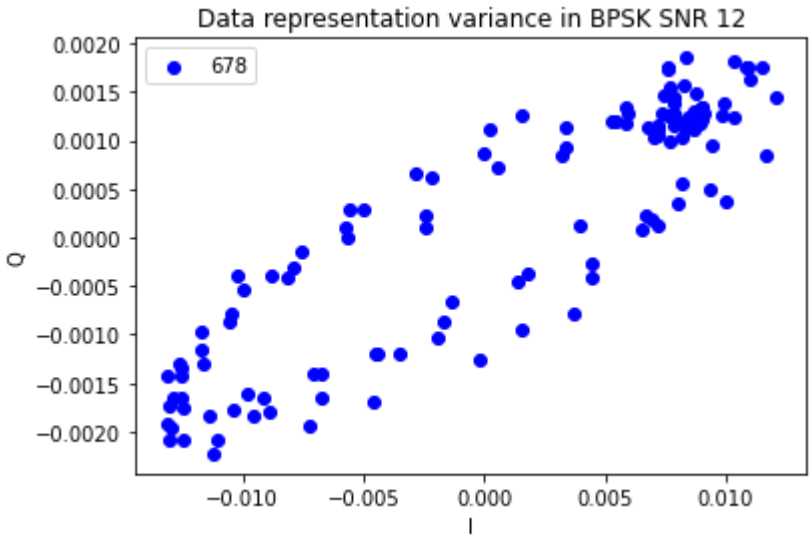

Data representation variance in BPSK SNR 12
673
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

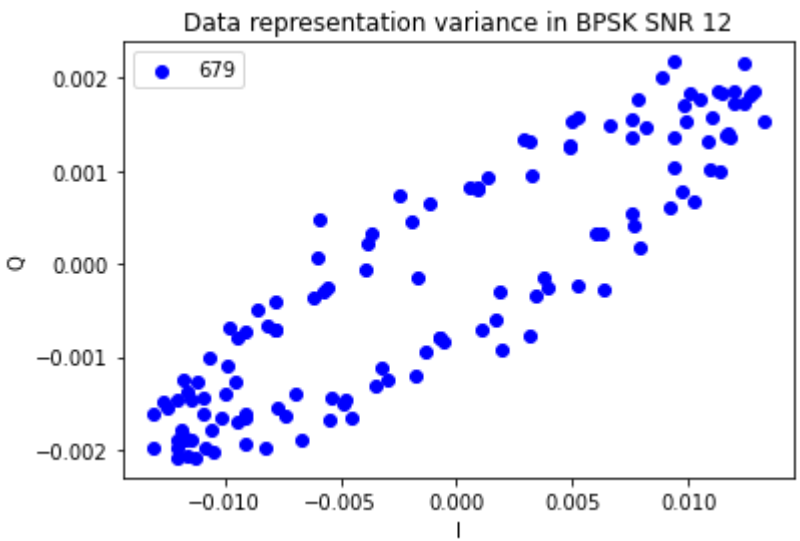

Data representation variance in BPSK SNR 12
674
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
675
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
676
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
677
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
678
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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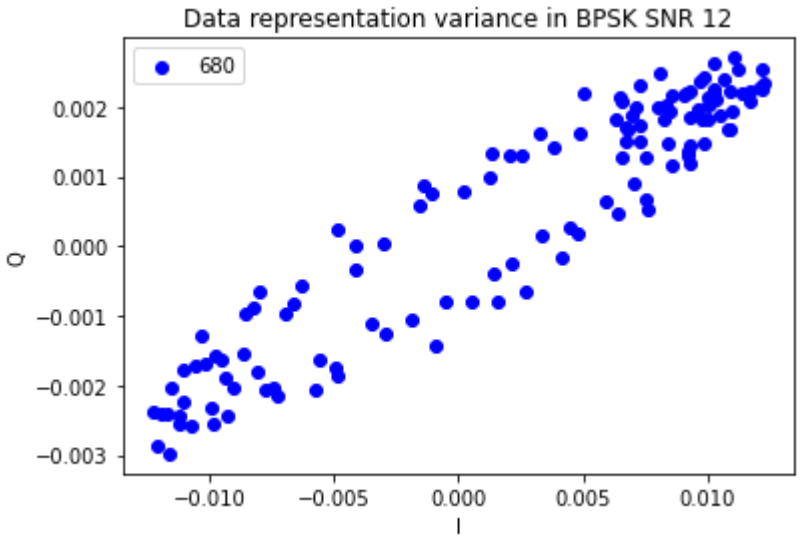
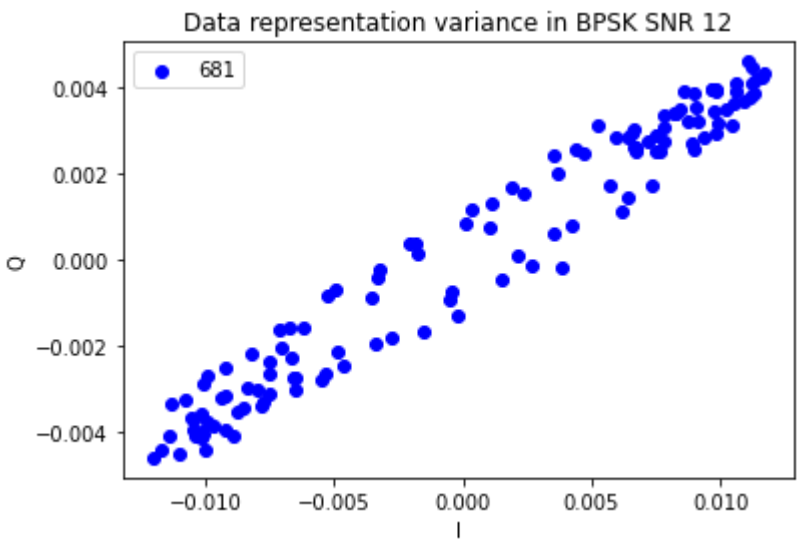
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
680
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
681
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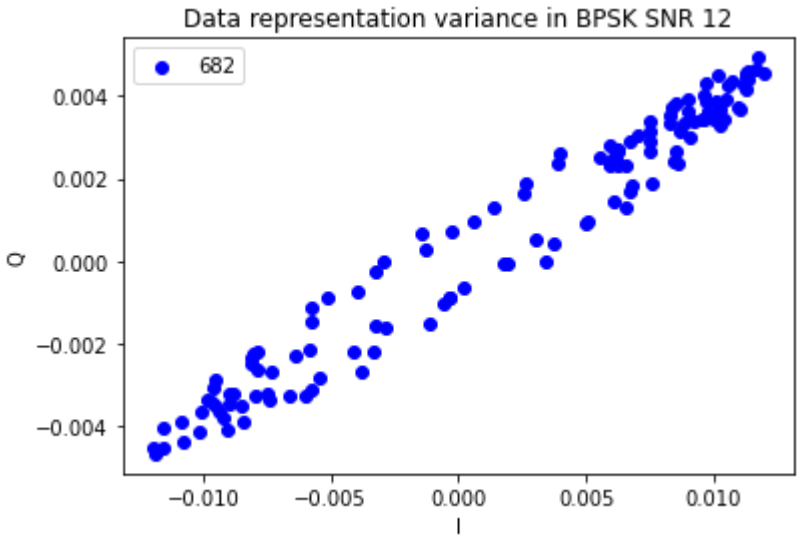
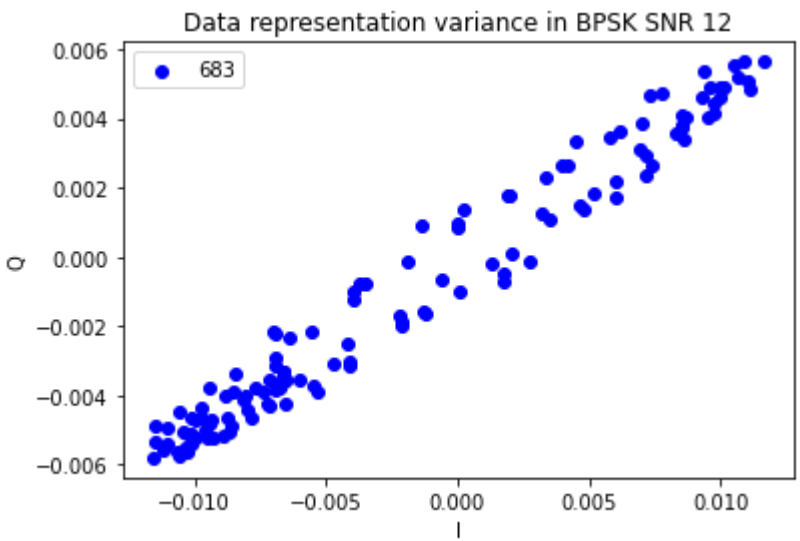
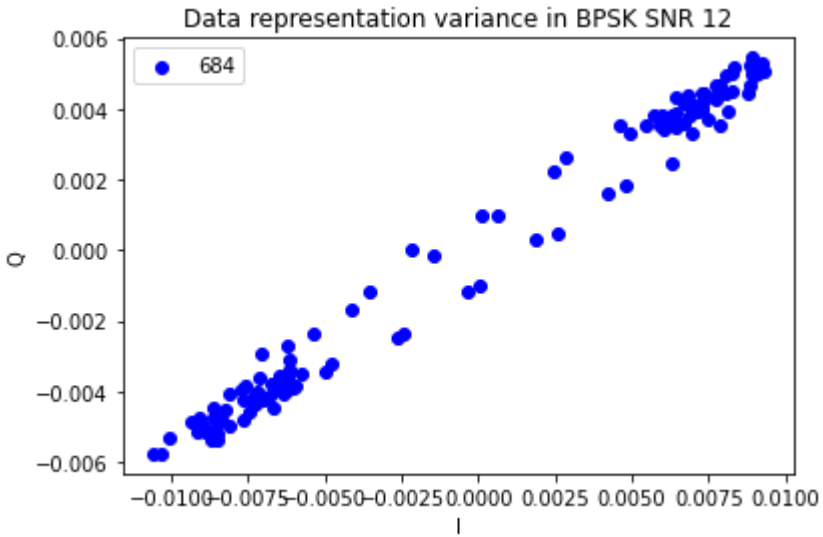
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
682
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
683
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
684
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
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−0.0075
−0.0050
−0.0025
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0.0025
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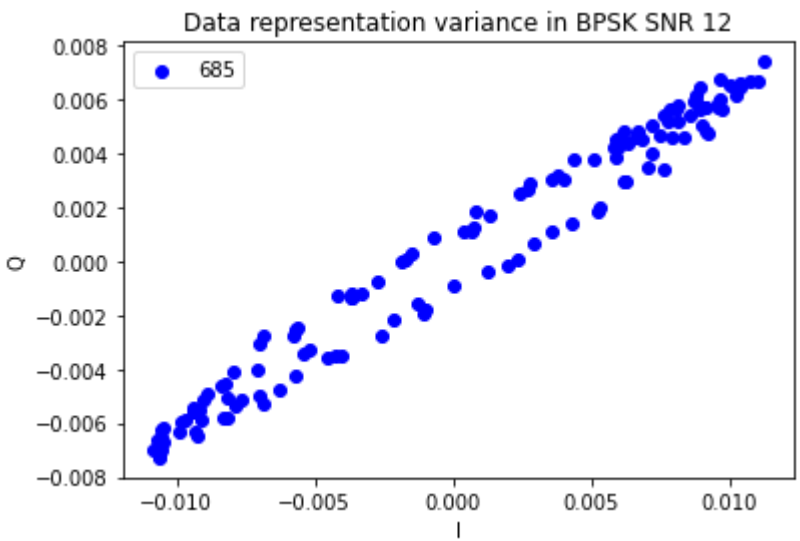
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
685
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
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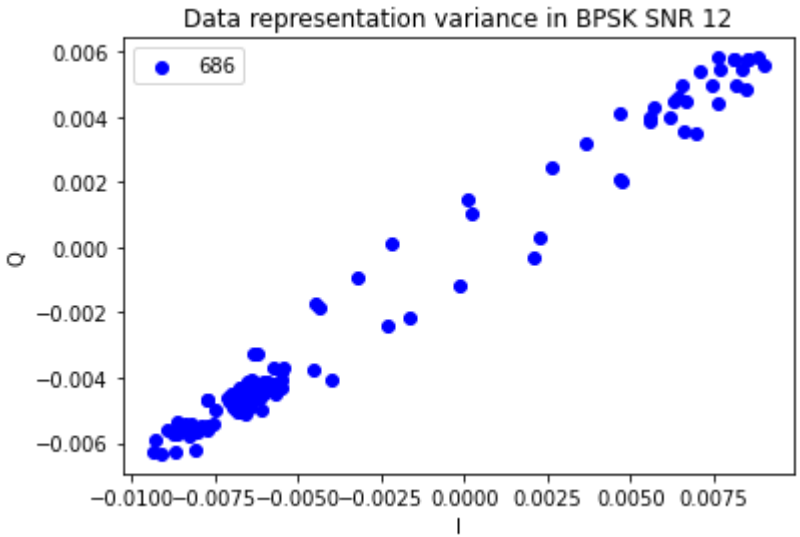
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
686
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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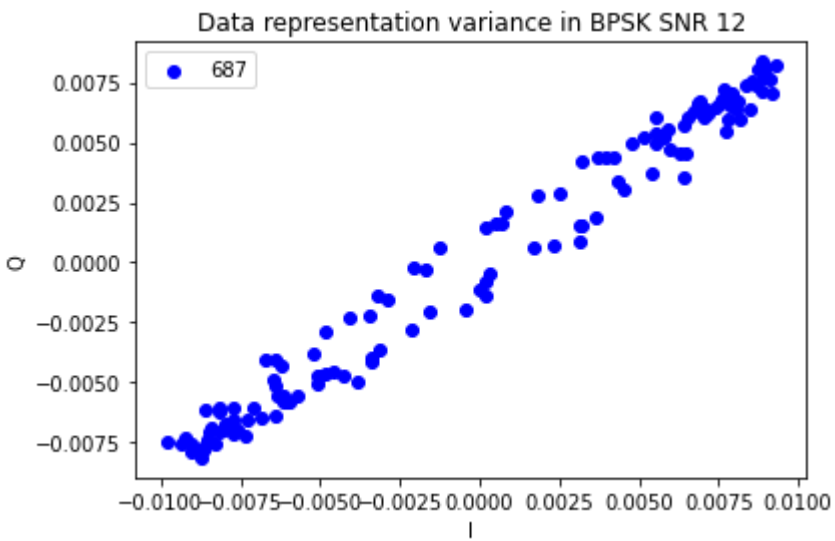
Data representation variance in BPSK SNR 12
687
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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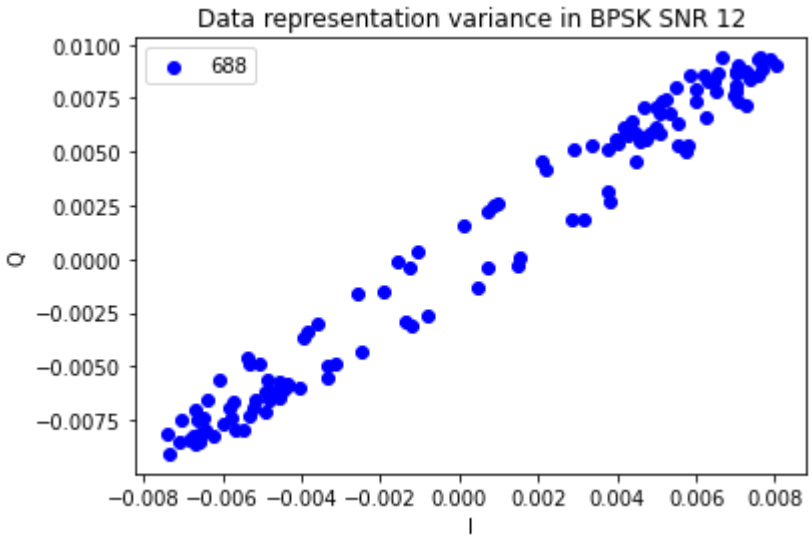
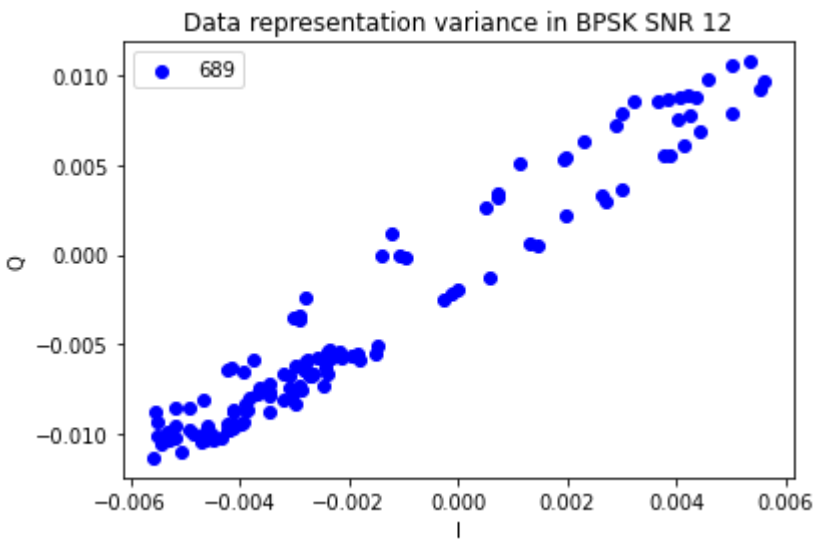
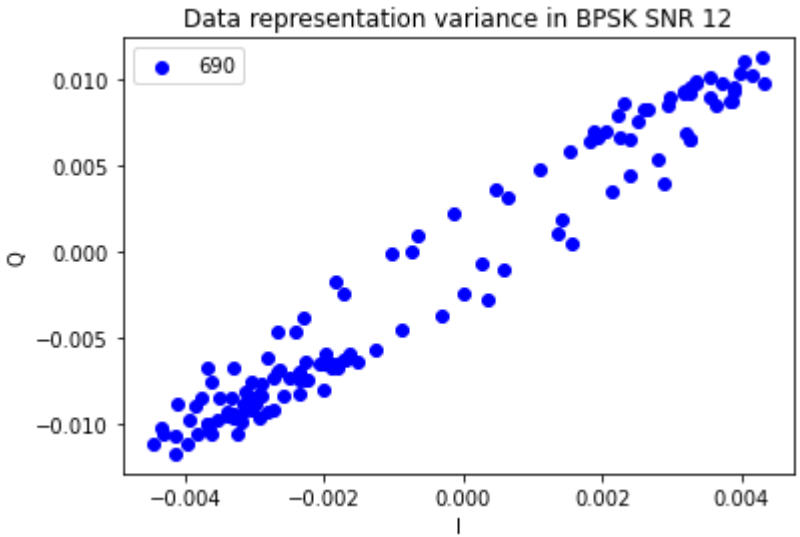
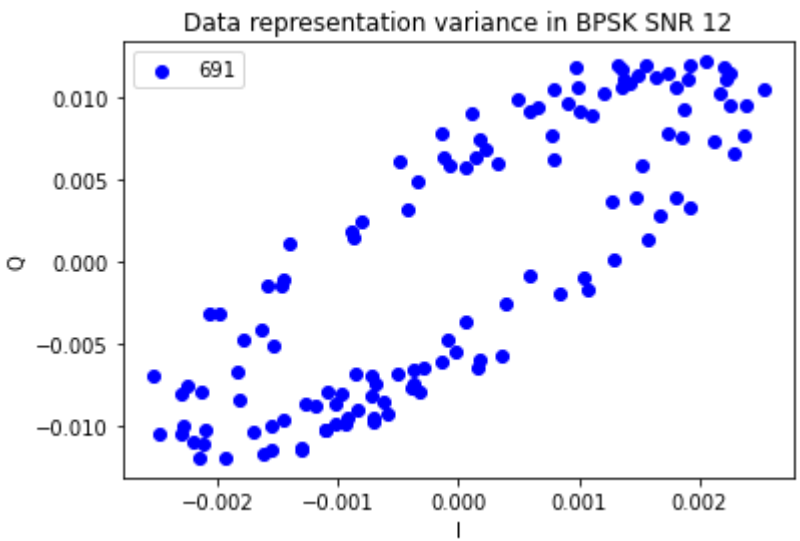

Data representation variance in BPSK SNR 12
688
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
689
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
690
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
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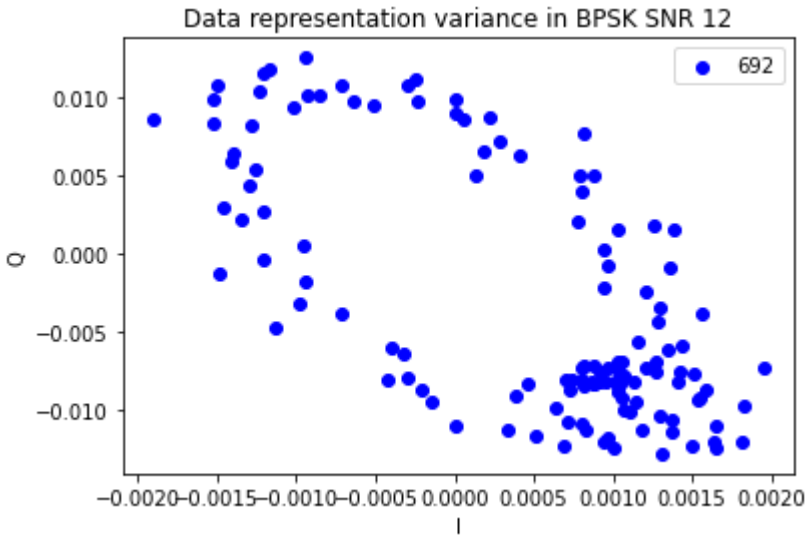
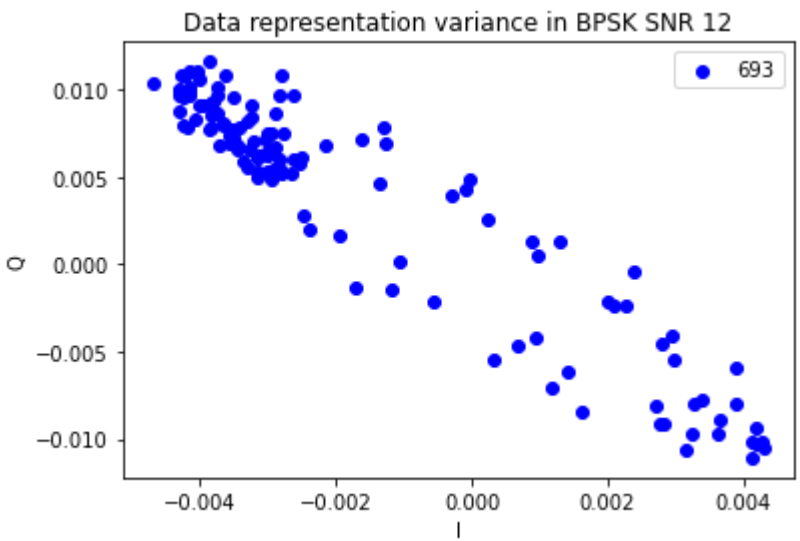
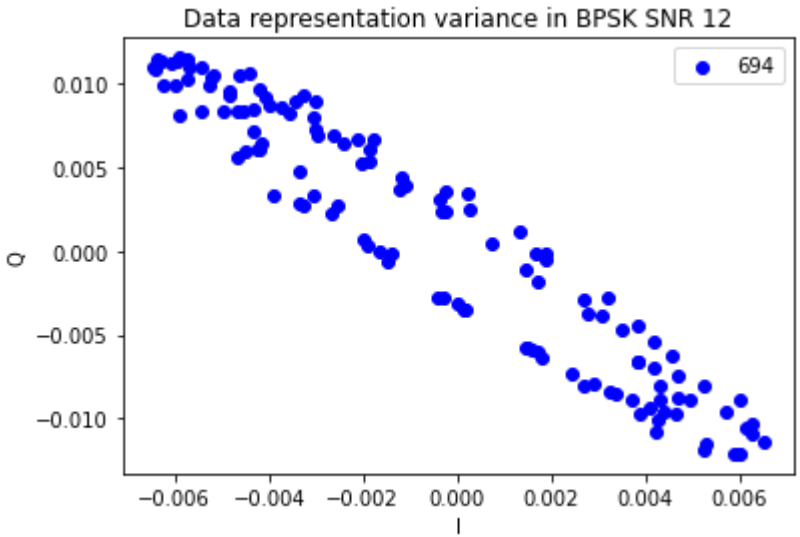
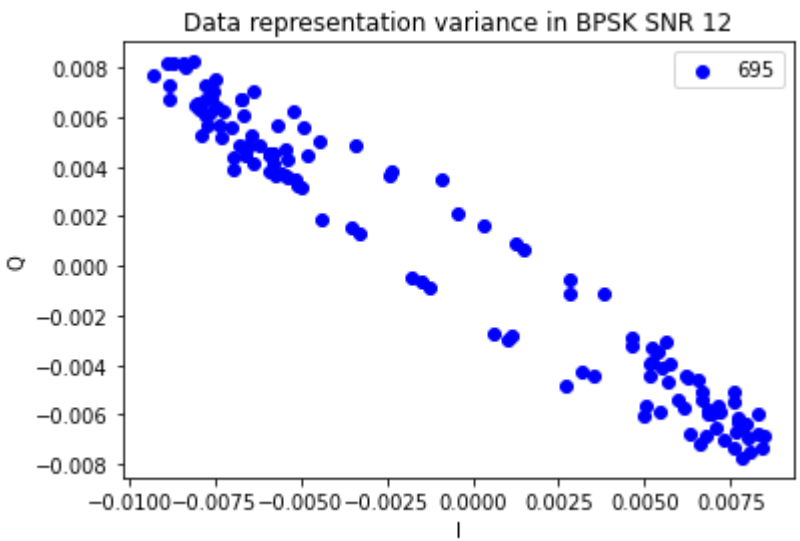
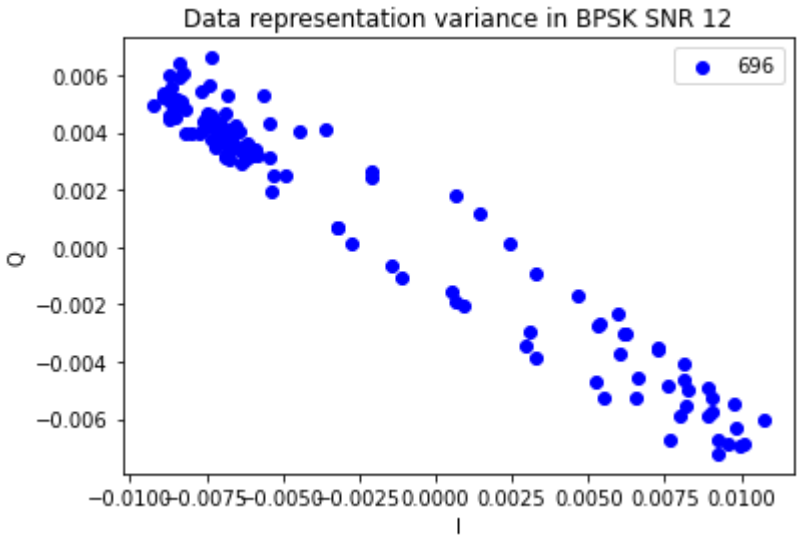
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

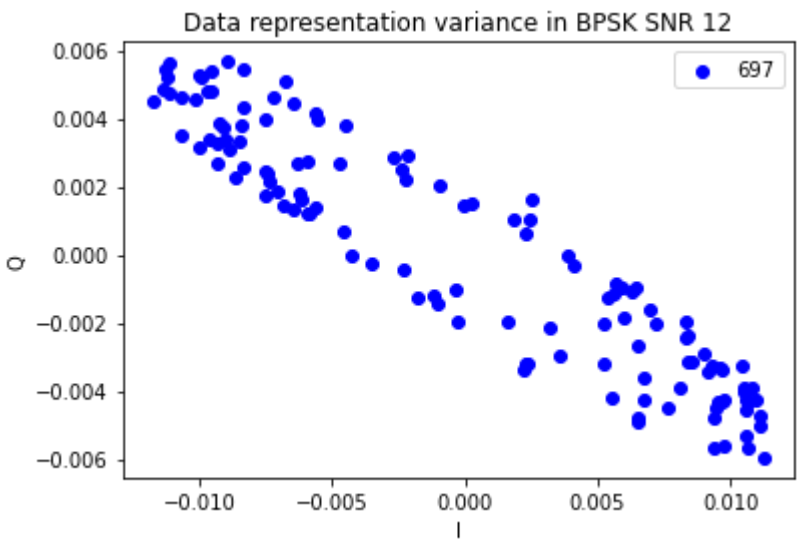

Data representation variance in BPSK SNR 12
692
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

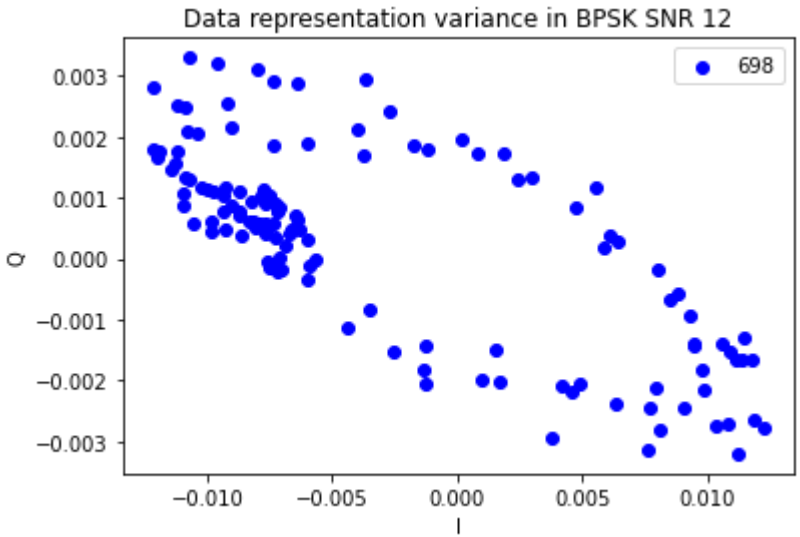

Data representation variance in BPSK SNR 12
693
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

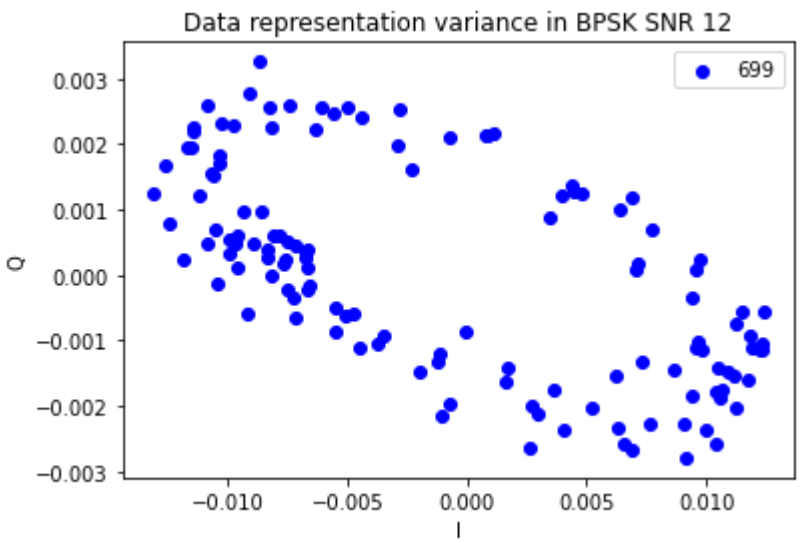

Data representation variance in BPSK SNR 12
694
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

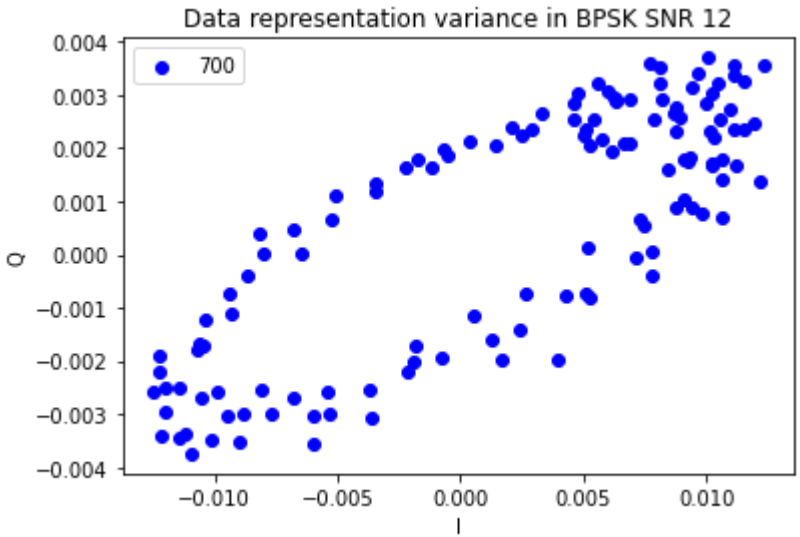

Data representation variance in BPSK SNR 12
695
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
I

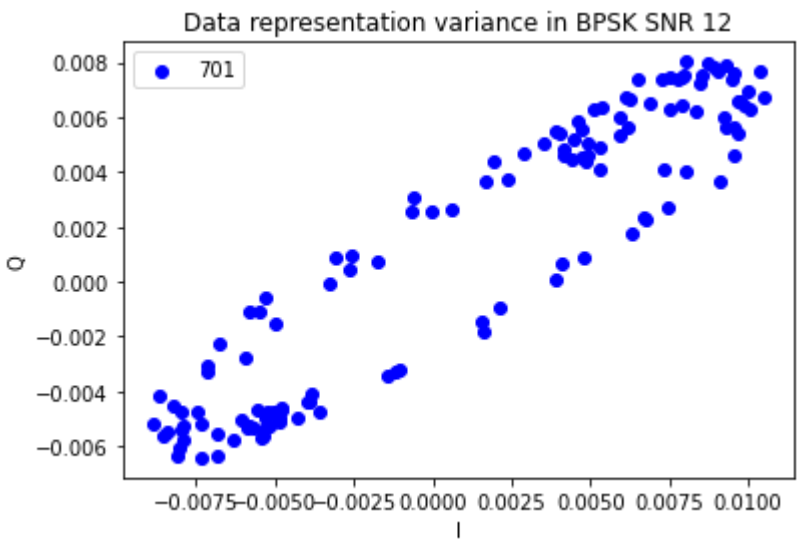

Data representation variance in BPSK SNR 12
696
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

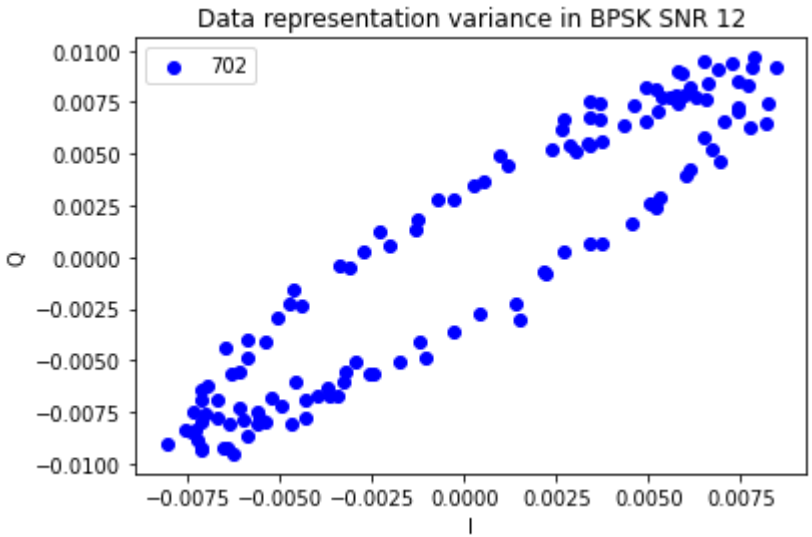

Data representation variance in BPSK SNR 12
697
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010 −0.005 0.000 0.005 0.010
I

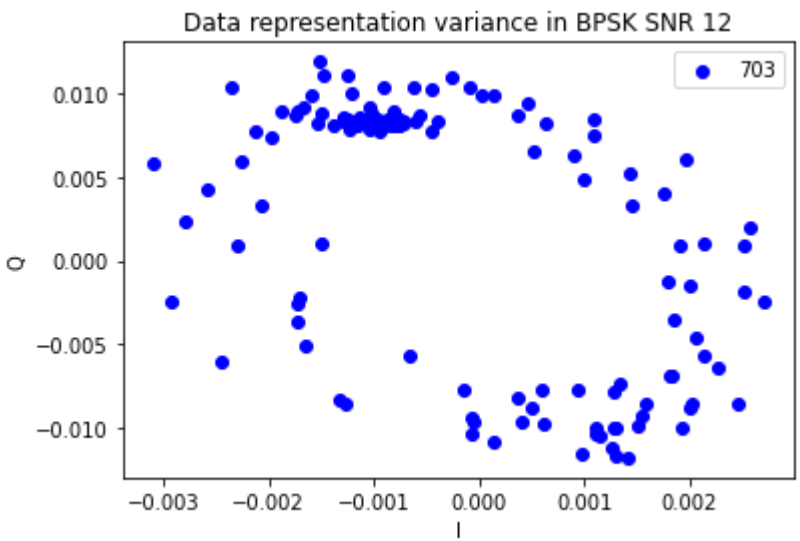

Data representation variance in BPSK SNR 12
698
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

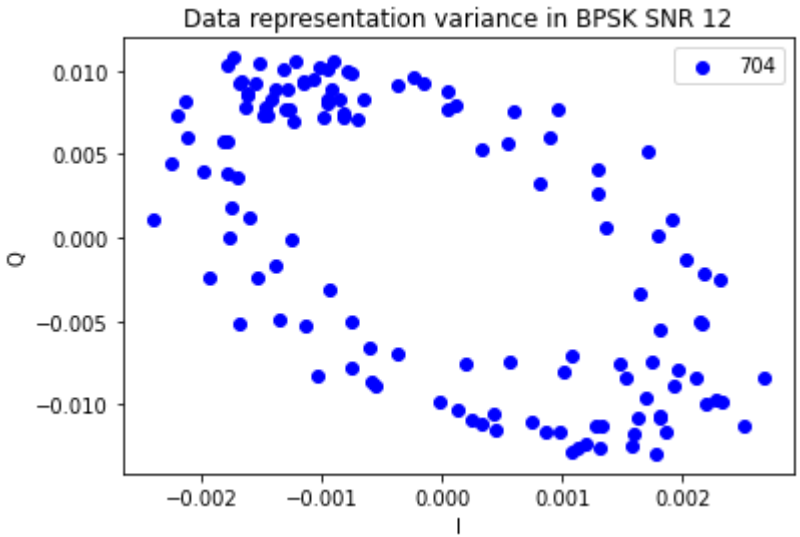

Data representation variance in BPSK SNR 12
699
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

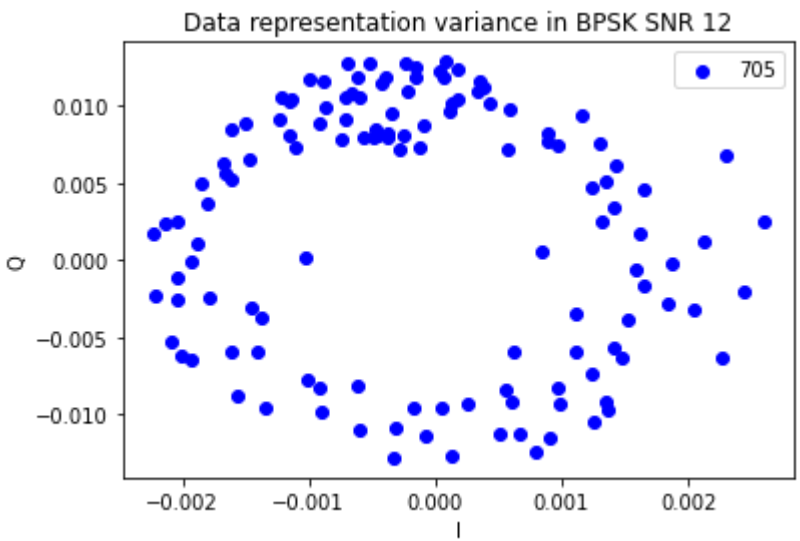

Data representation variance in BPSK SNR 12
700
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

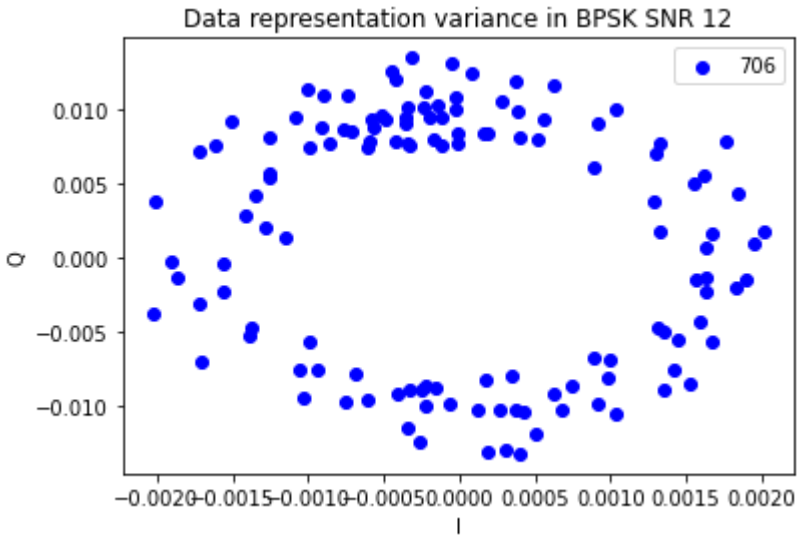

Data representation variance in BPSK SNR 12
701
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
702
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
703
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002
I


Data representation variance in BPSK SNR 12
704
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
705
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
706
0.010
0.005
0.000
−0.005
−0.010
Q
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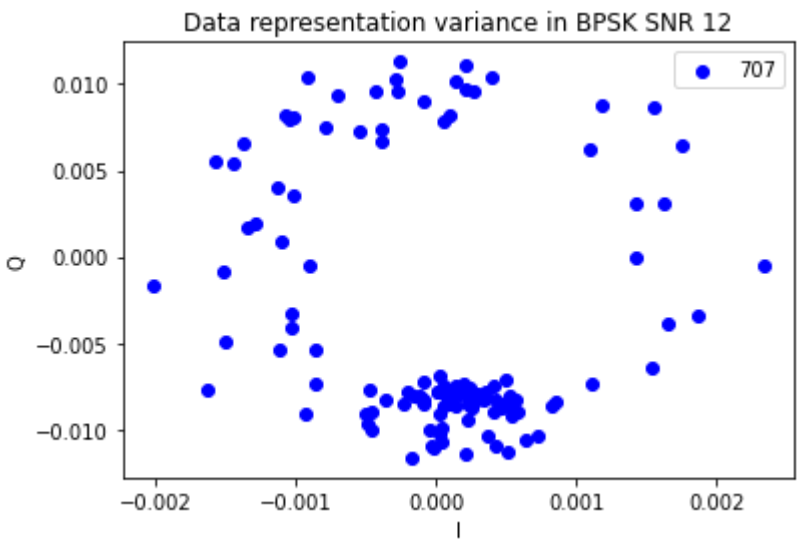
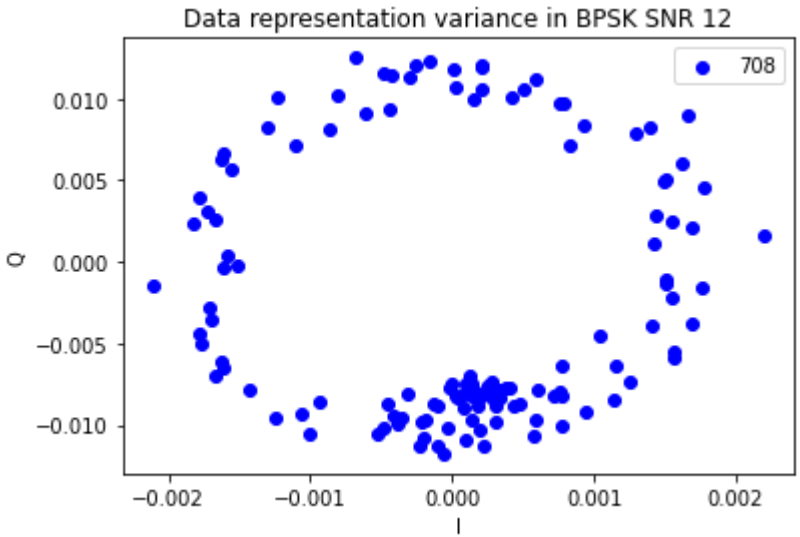
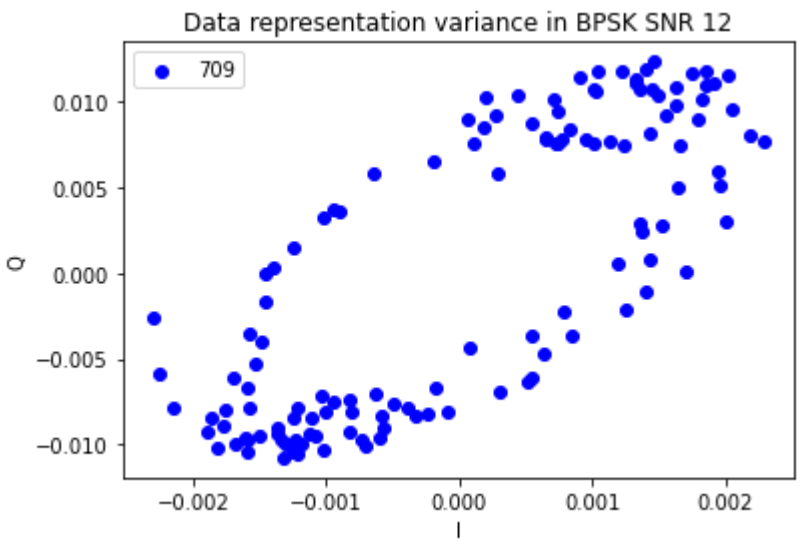
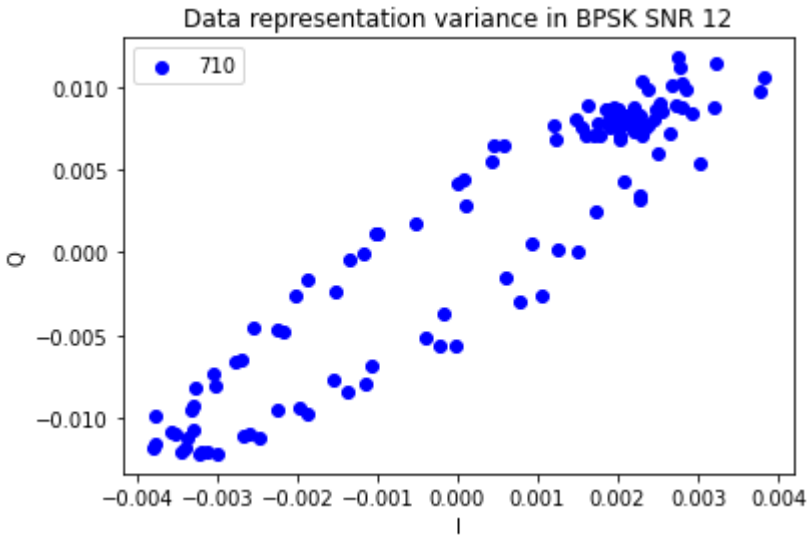
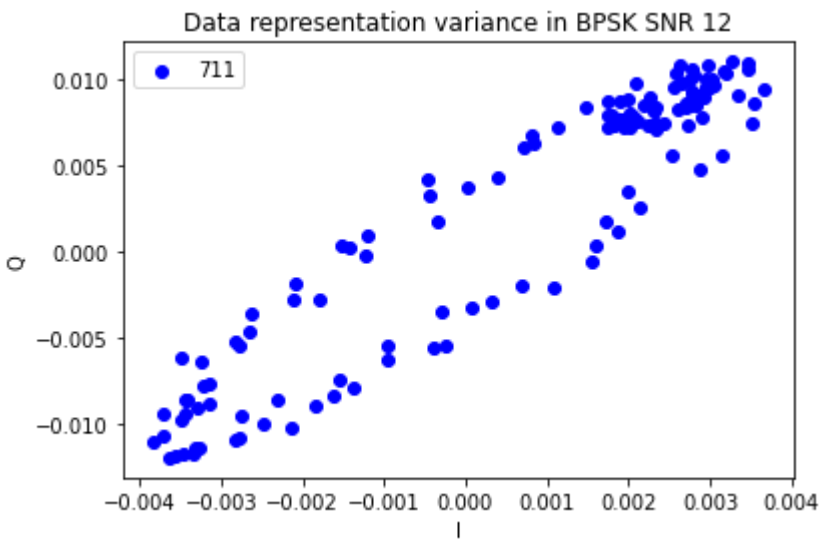
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
I

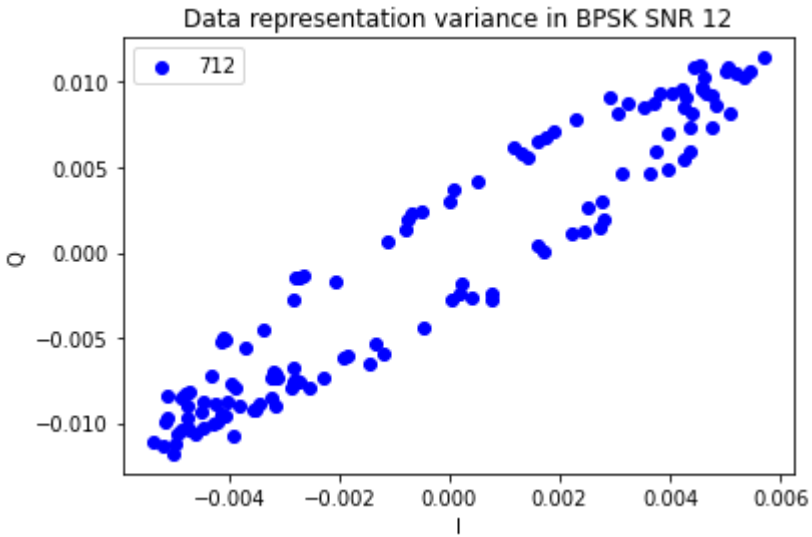

Data representation variance in BPSK SNR 12
707
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

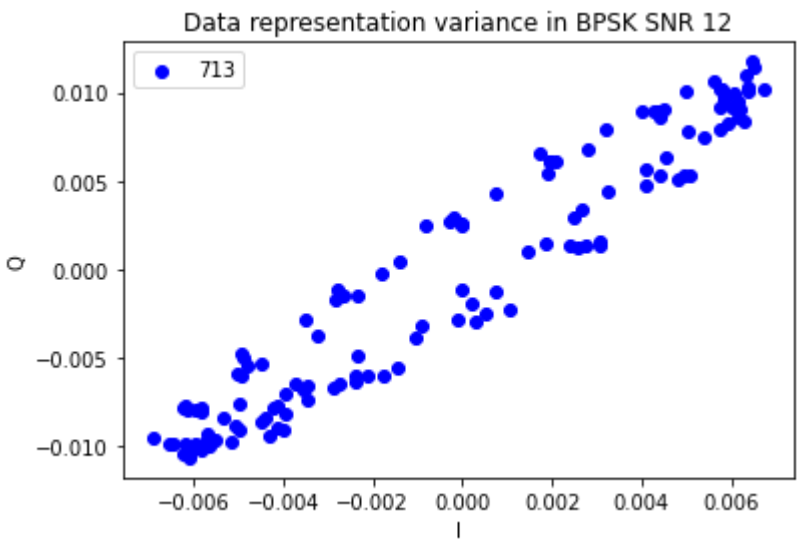

Data representation variance in BPSK SNR 12
708
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

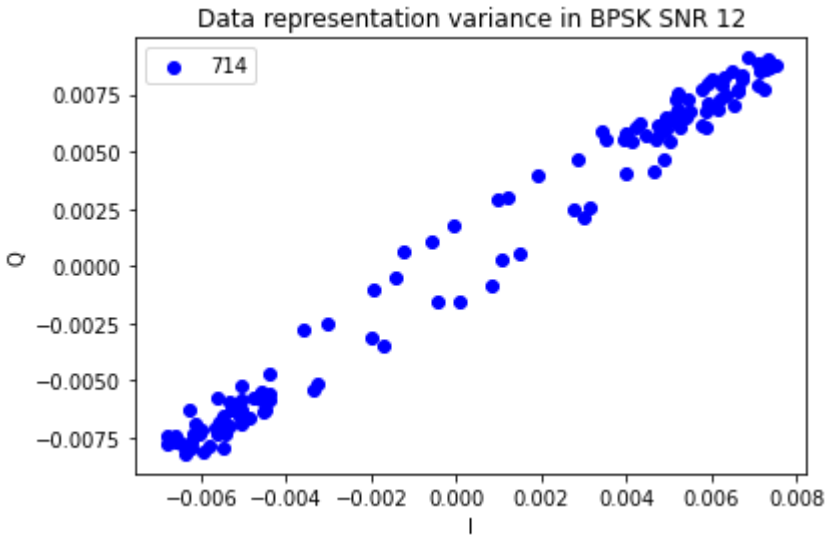

Data representation variance in BPSK SNR 12
709
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

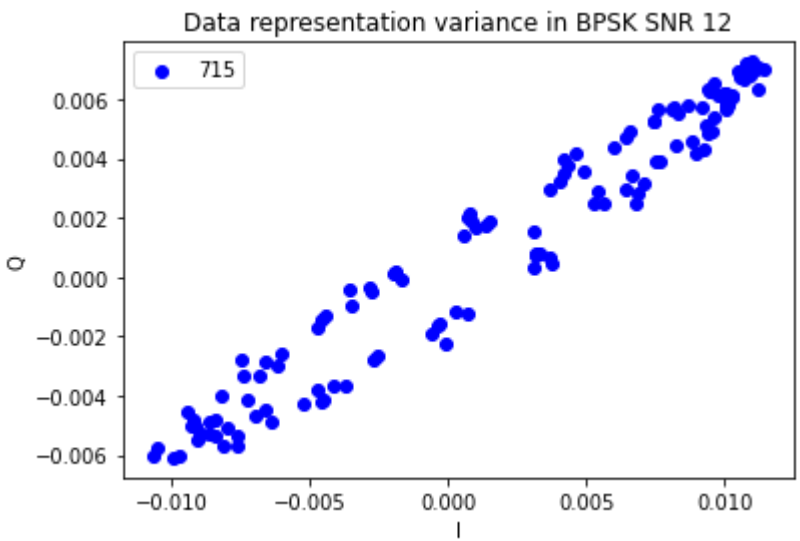

Data representation variance in BPSK SNR 12
710
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

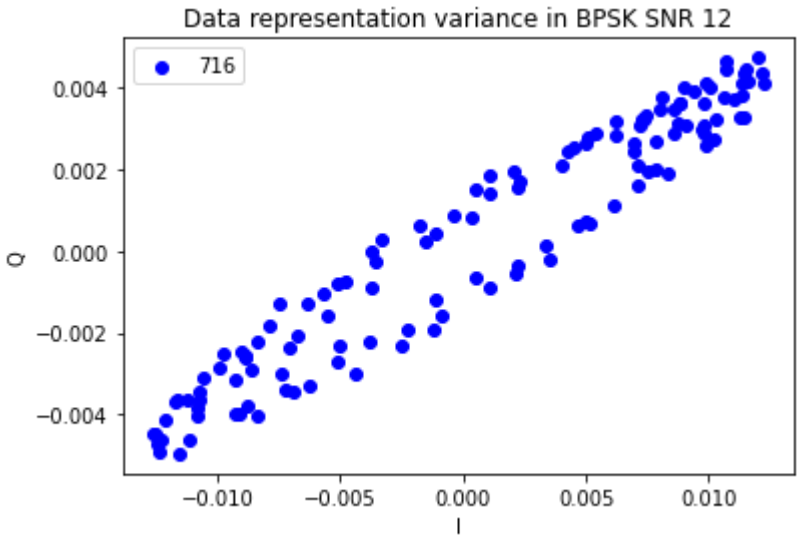

Data representation variance in BPSK SNR 12
711
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

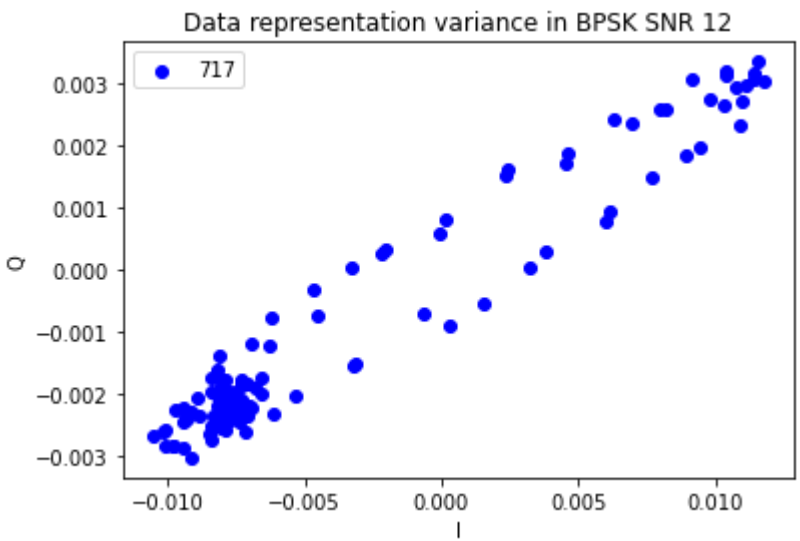

Data representation variance in BPSK SNR 12
712
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
0.006
I

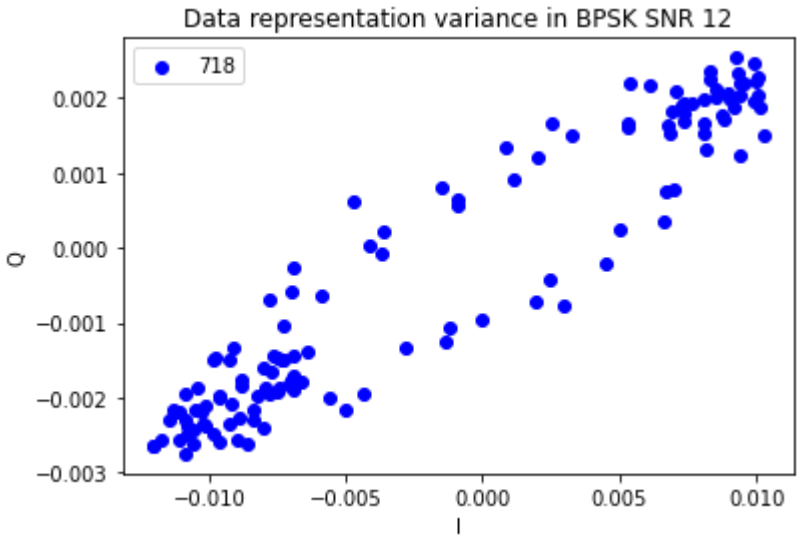

Data representation variance in BPSK SNR 12
713
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

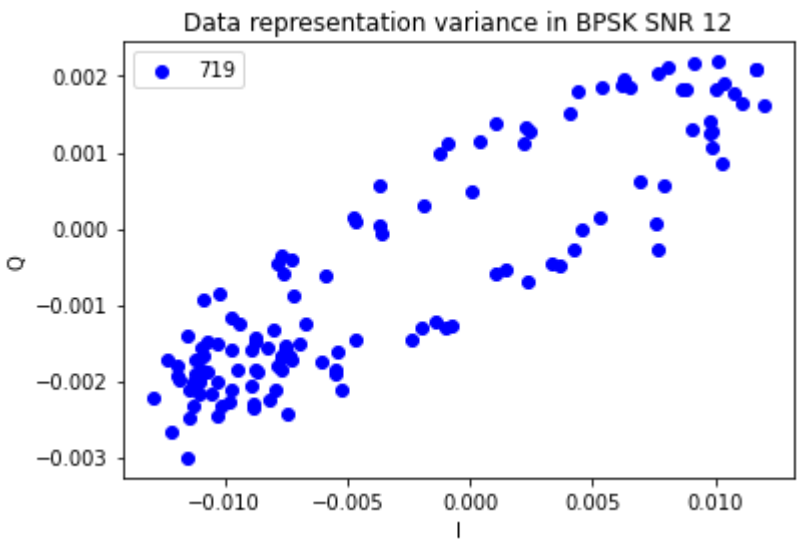

Data representation variance in BPSK SNR 12
714
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I

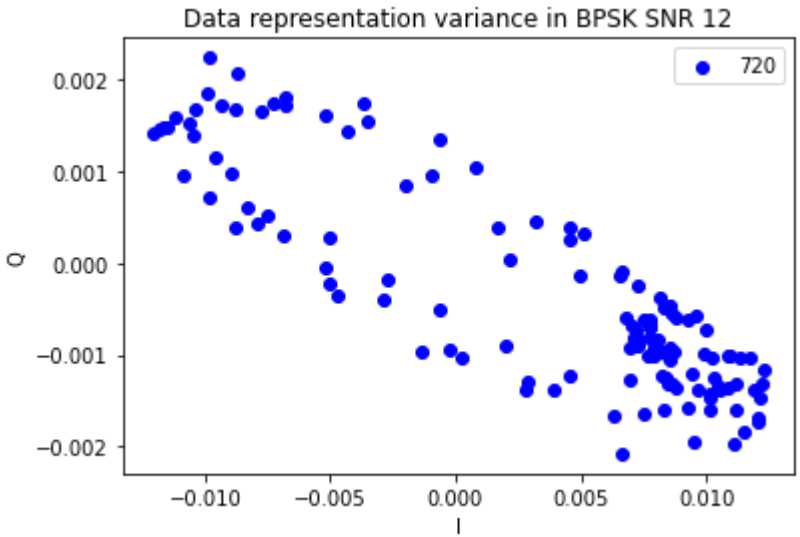

Data representation variance in BPSK SNR 12
715
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

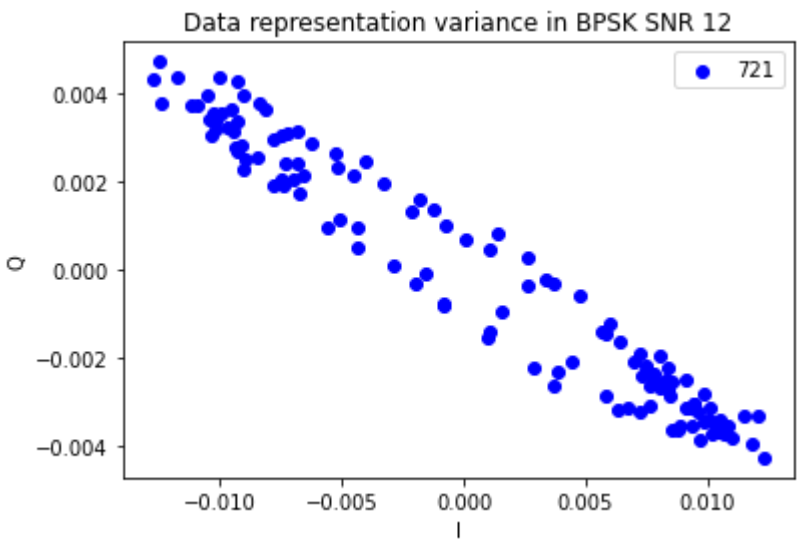

Data representation variance in BPSK SNR 12
716
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

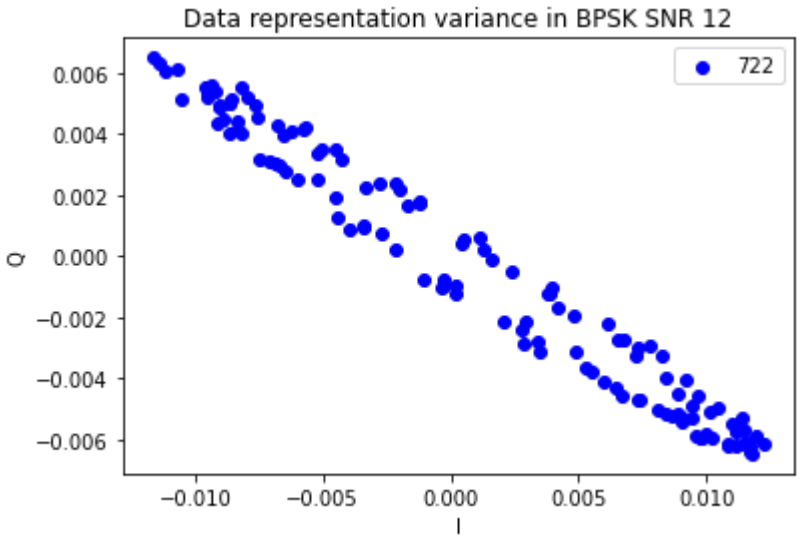

Data representation variance in BPSK SNR 12
717
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

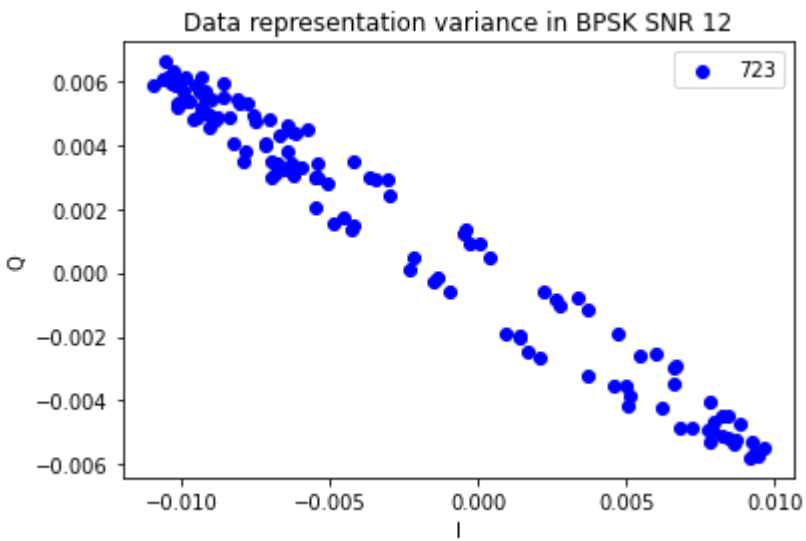

Data representation variance in BPSK SNR 12
718
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

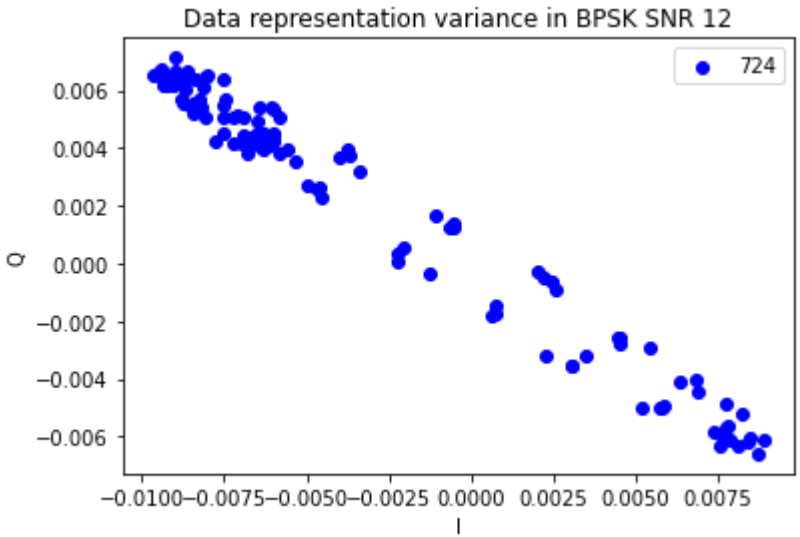

Data representation variance in BPSK SNR 12
719
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

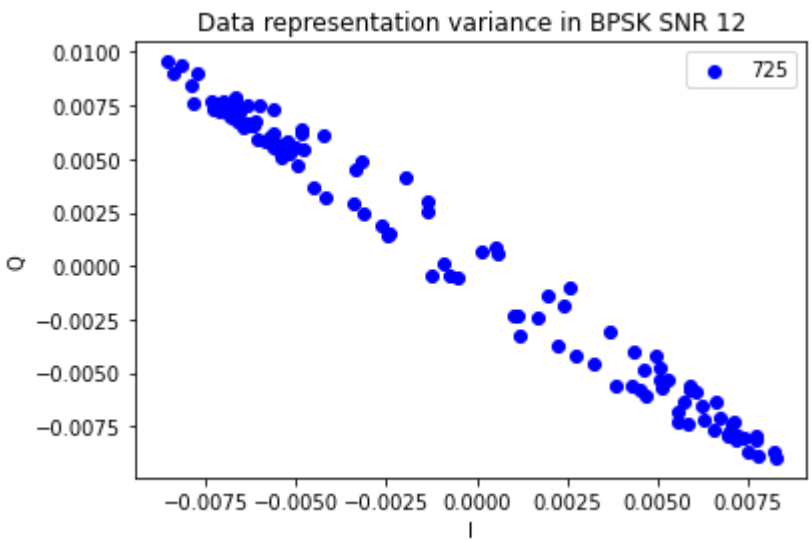

Data representation variance in BPSK SNR 12
720
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

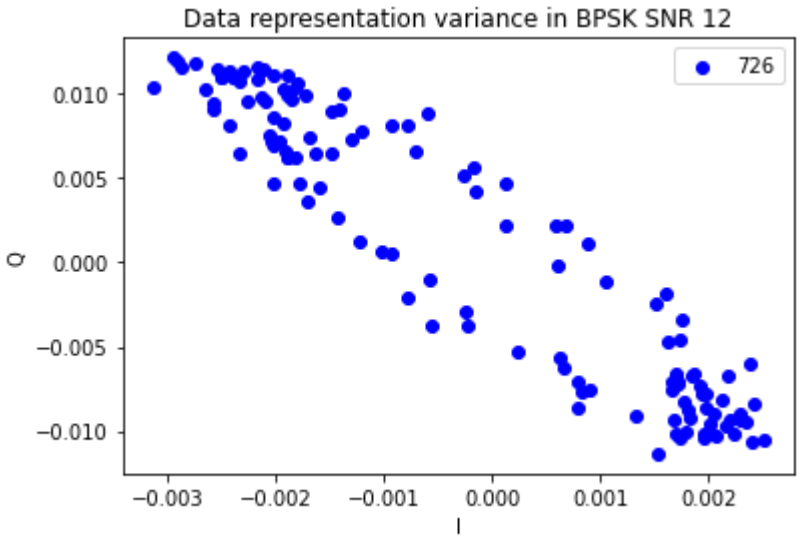

Data representation variance in BPSK SNR 12
721
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

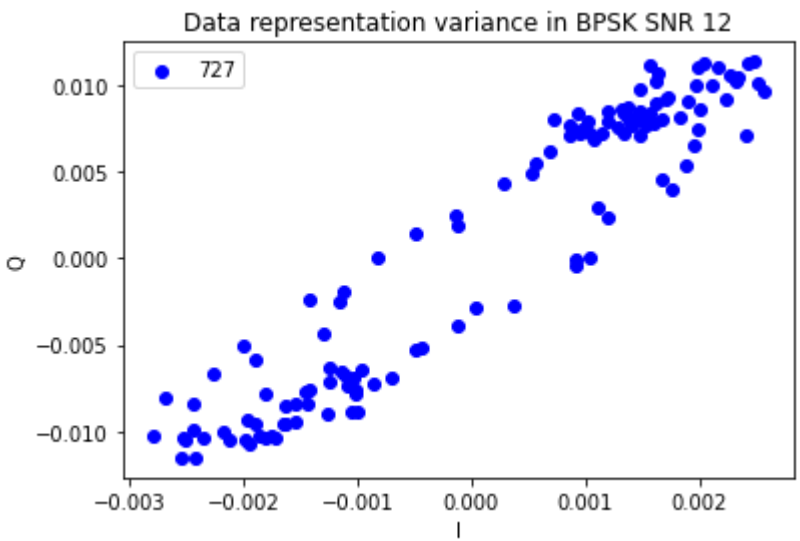

Data representation variance in BPSK SNR 12
722
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

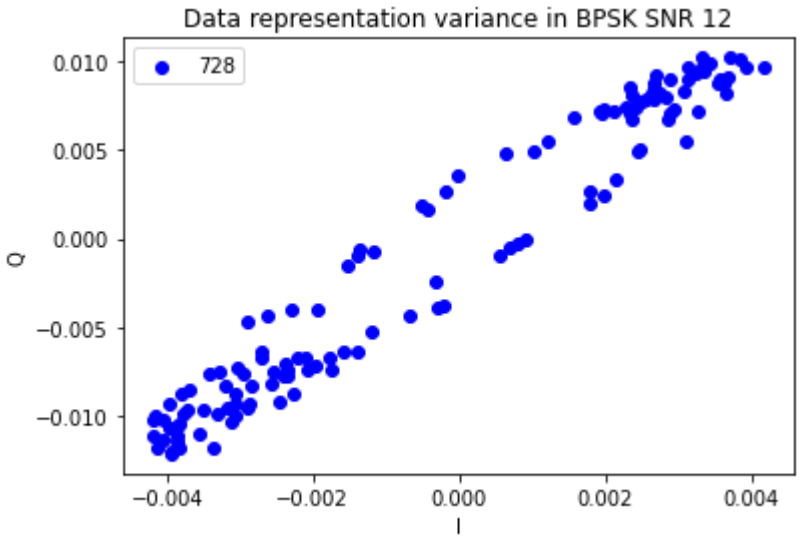

Data representation variance in BPSK SNR 12
723
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

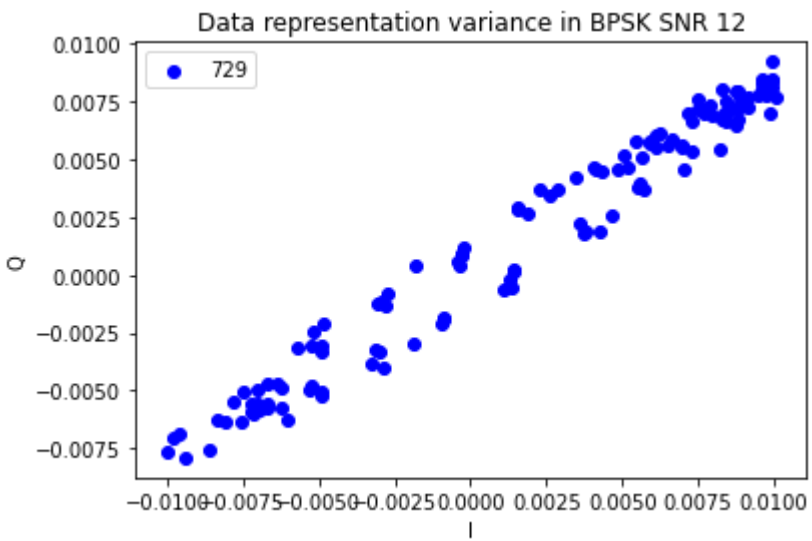

Data representation variance in BPSK SNR 12
724
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
725
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
726
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
727
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
728
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
729
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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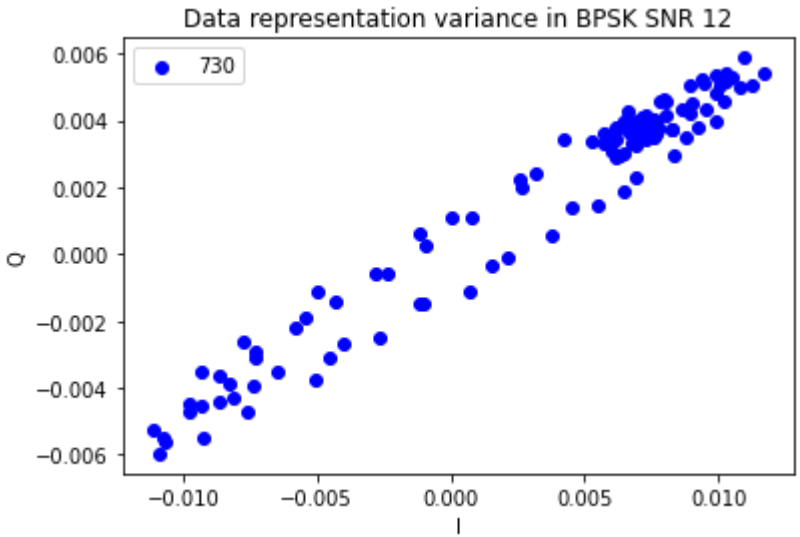
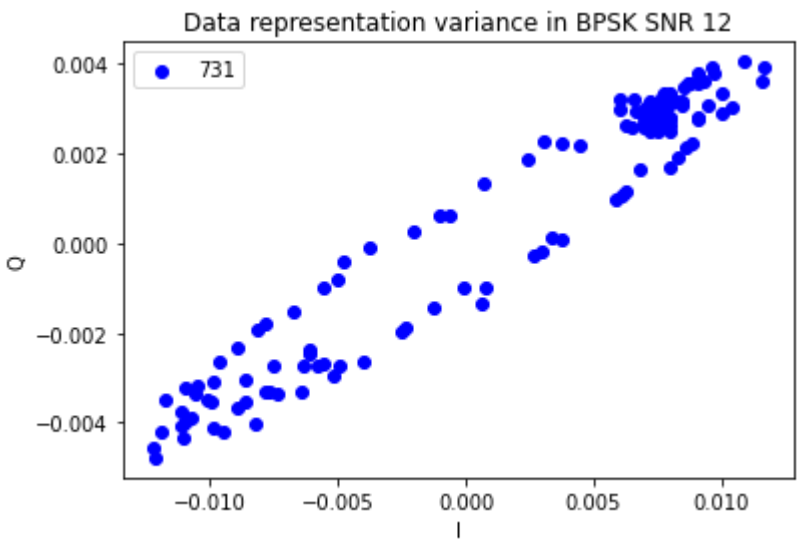
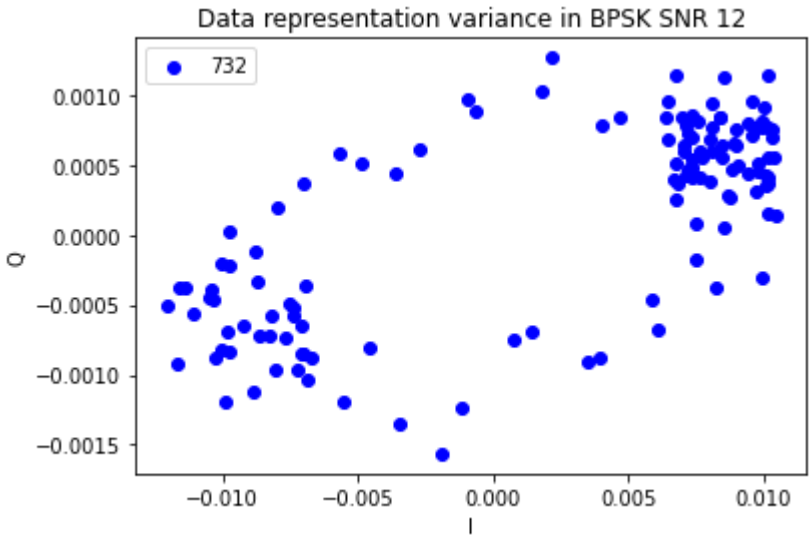
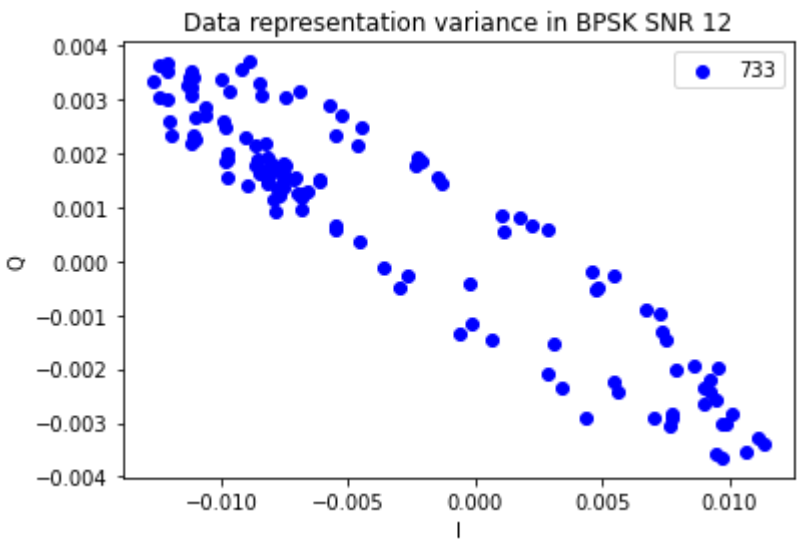
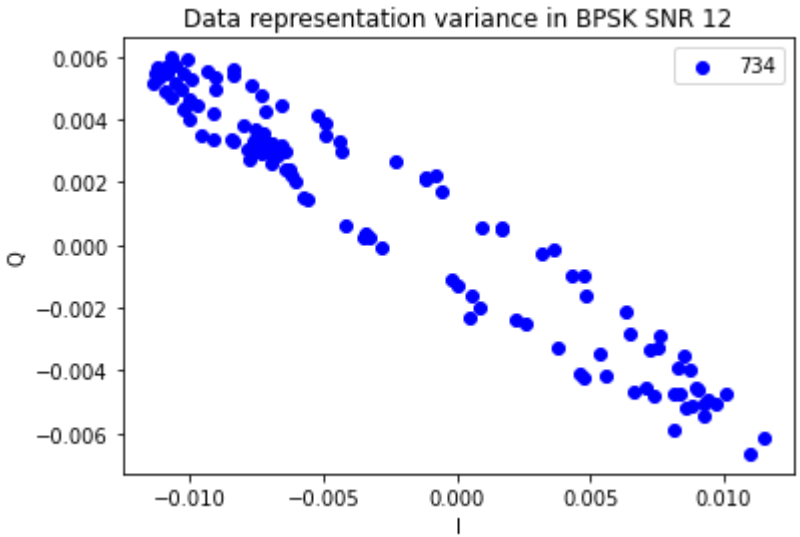
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

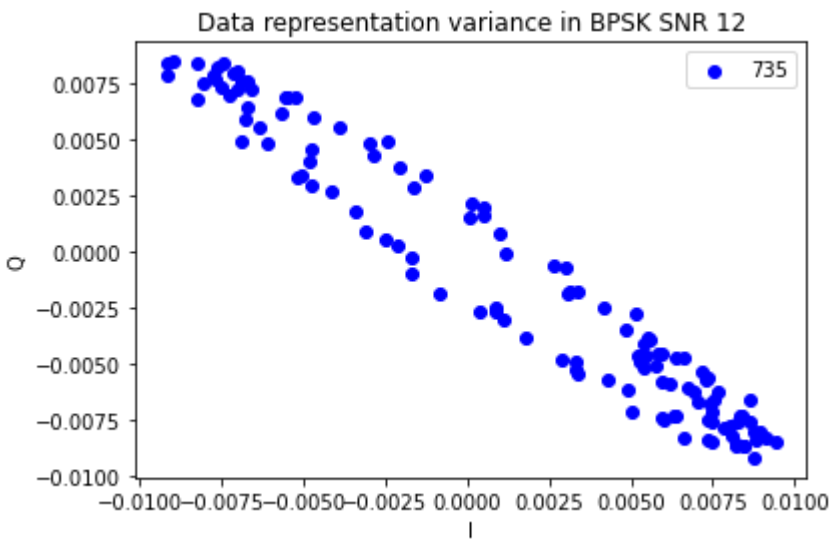

Data representation variance in BPSK SNR 12
730
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

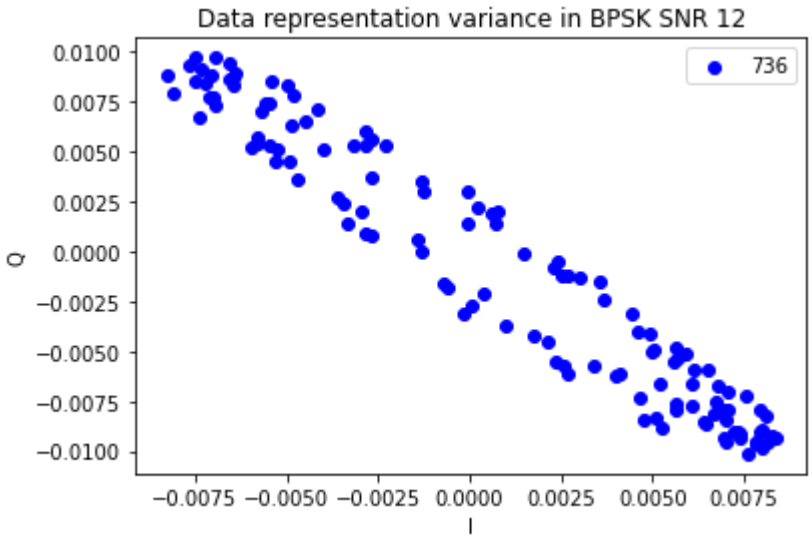

Data representation variance in BPSK SNR 12
731
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

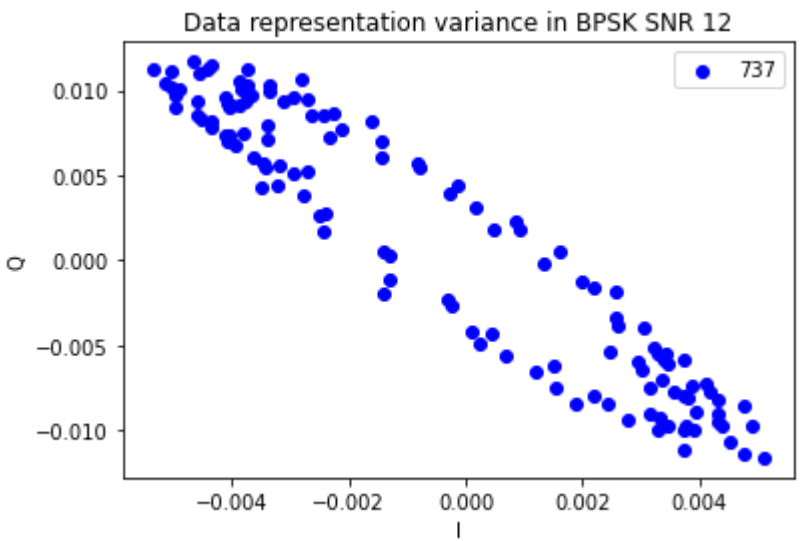

Data representation variance in BPSK SNR 12
732
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
733
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
734
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
735
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I


Data representation variance in BPSK SNR 12
736
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
737
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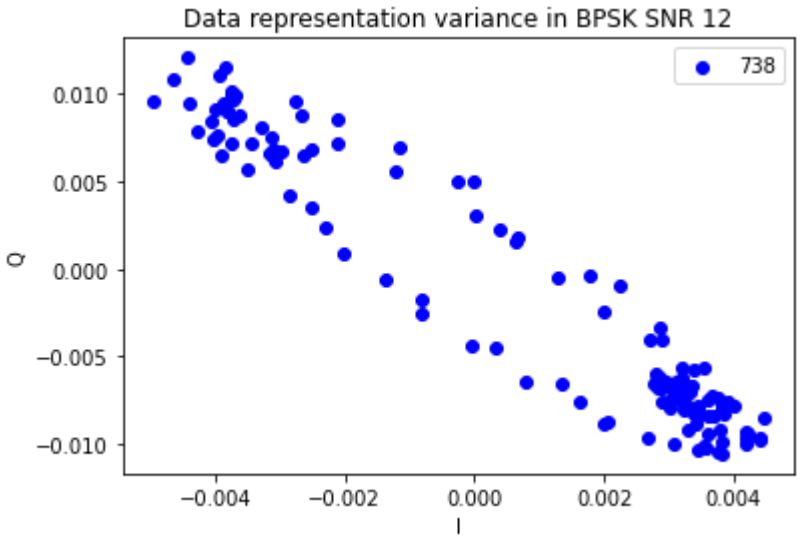
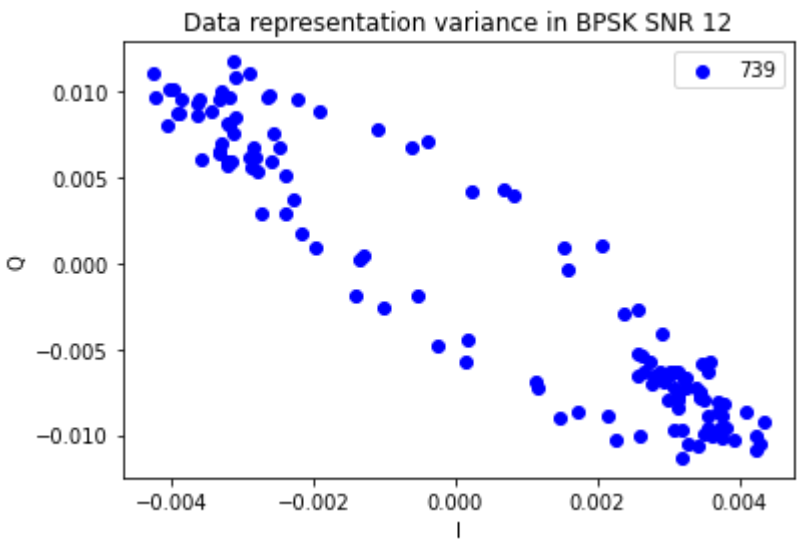
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I


Data representation variance in BPSK SNR 12
738
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
739
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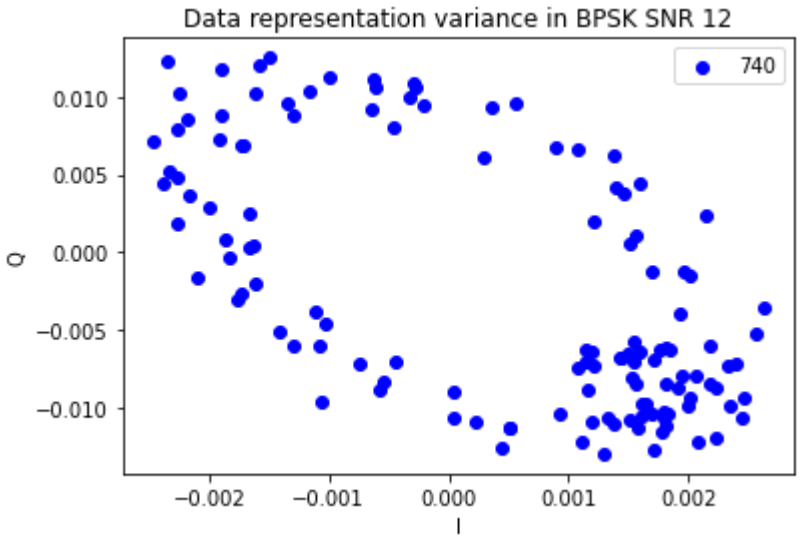
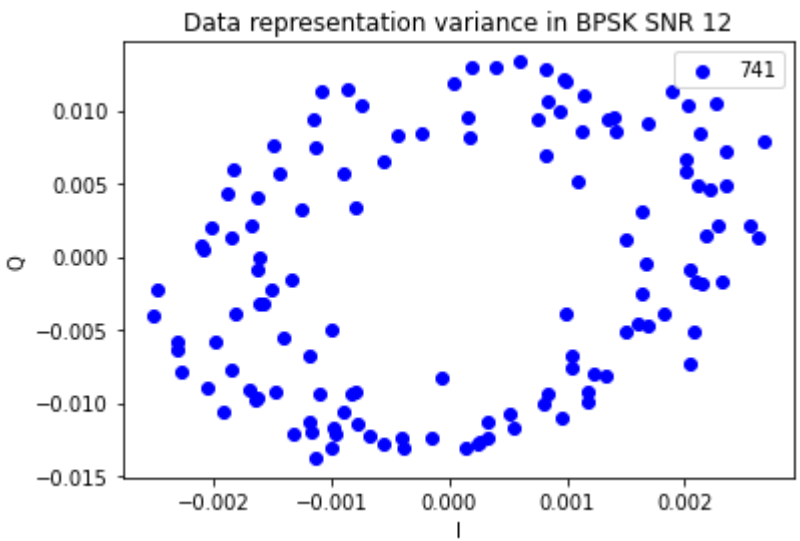
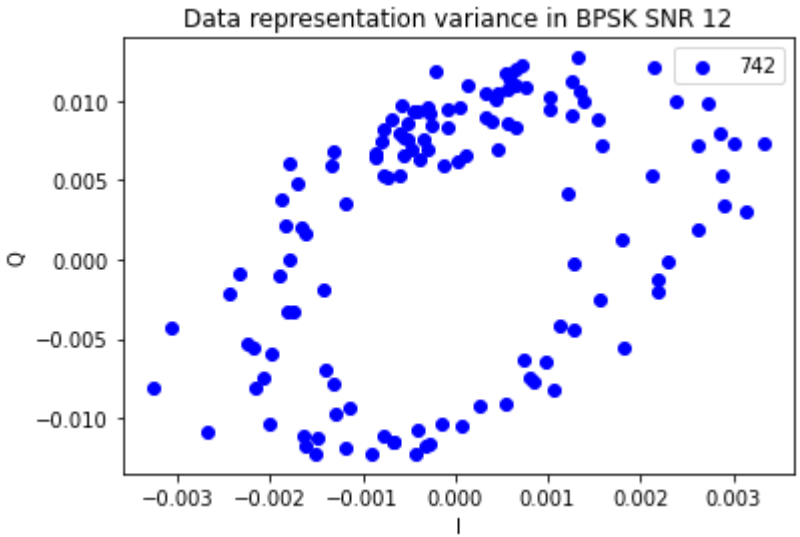
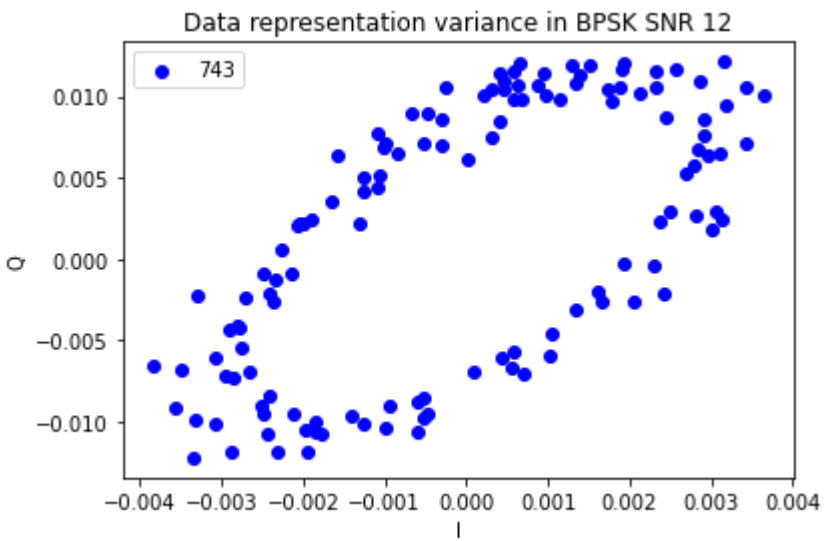
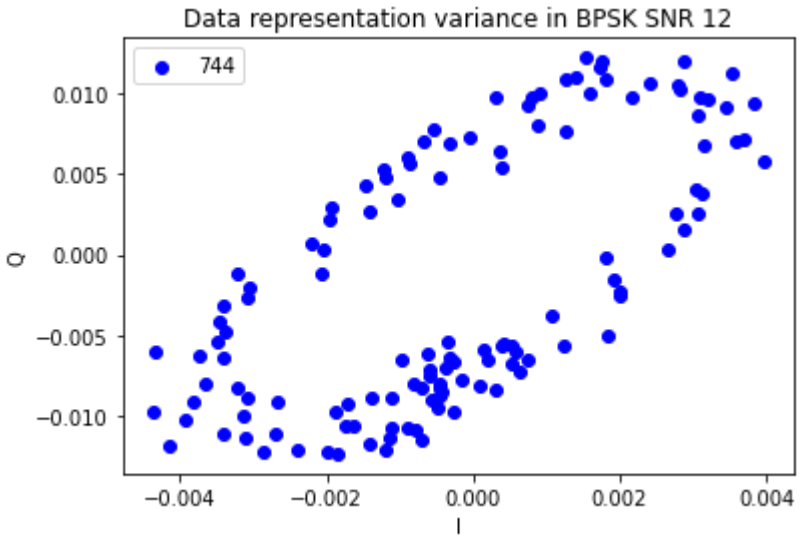
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
740
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
741
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
742
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
743
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I


Data representation variance in BPSK SNR 12
744
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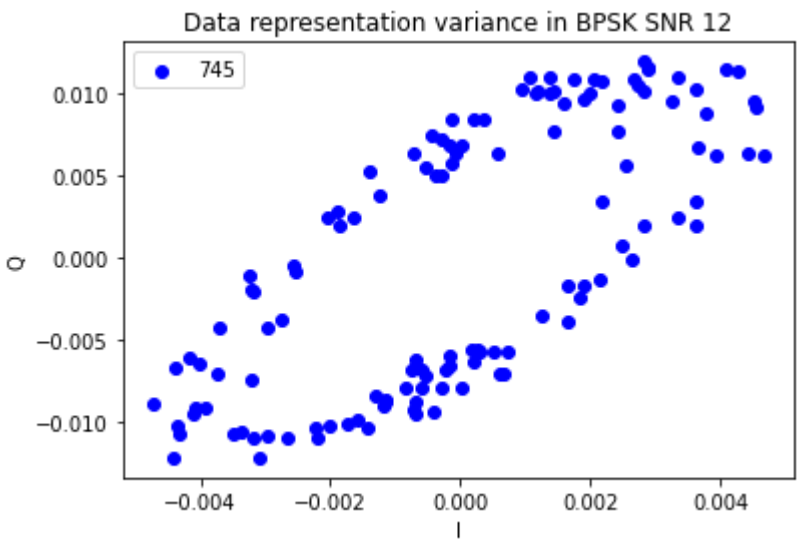
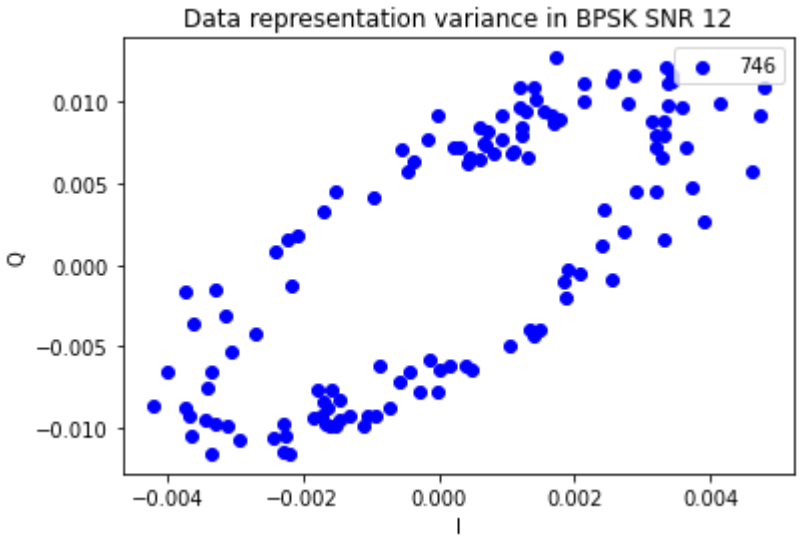
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
745
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
746
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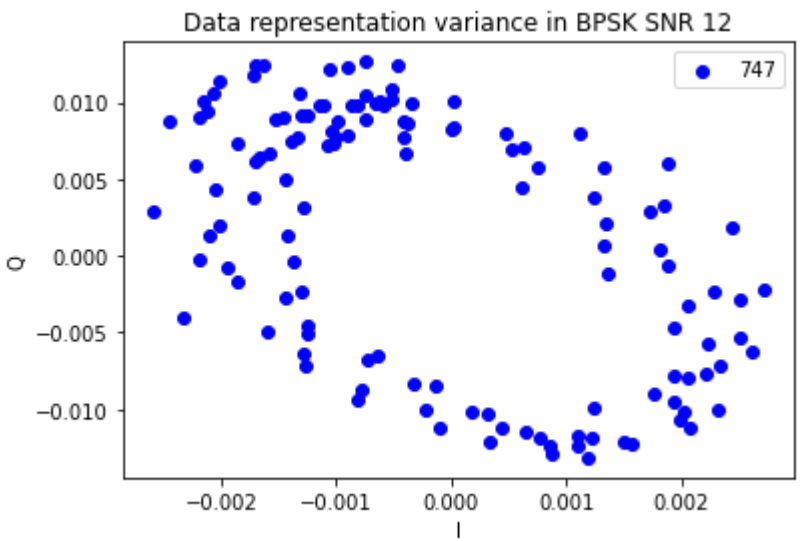
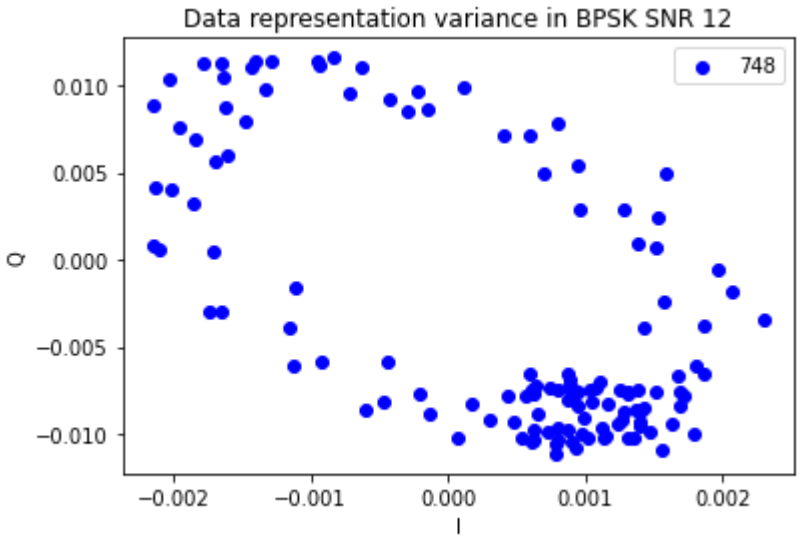
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
747
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
748
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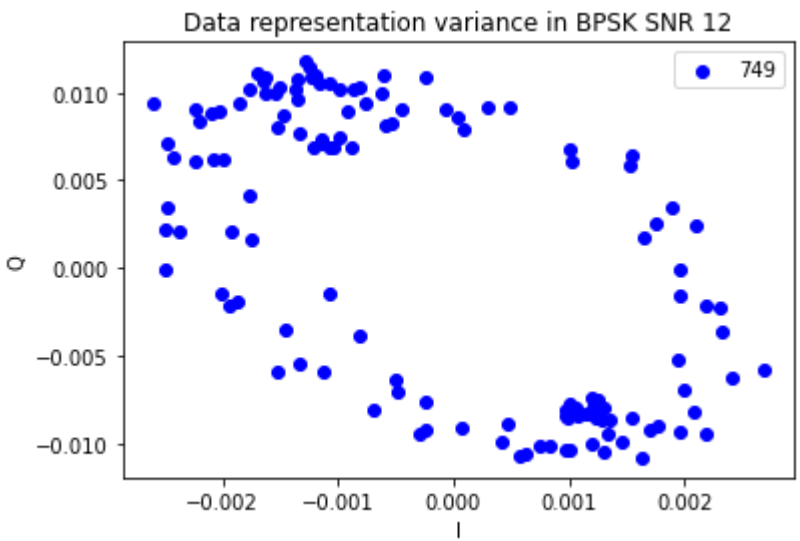
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
749
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
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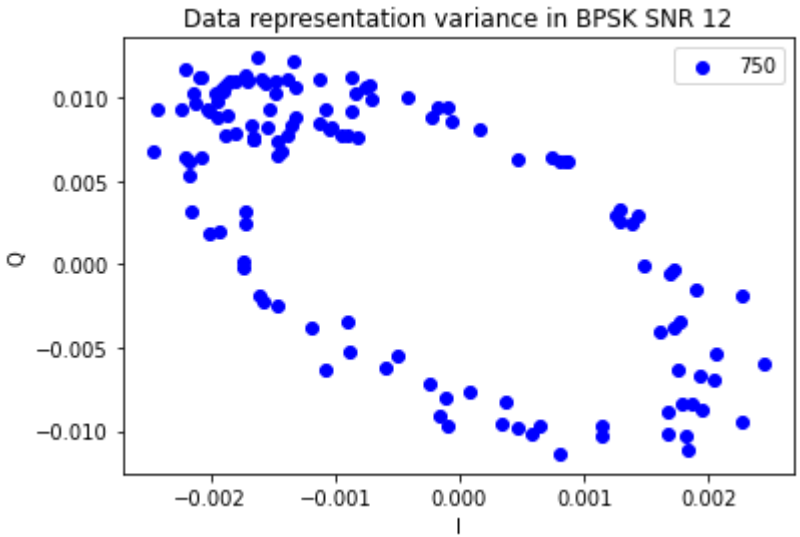
Data representation variance in BPSK SNR 12
750
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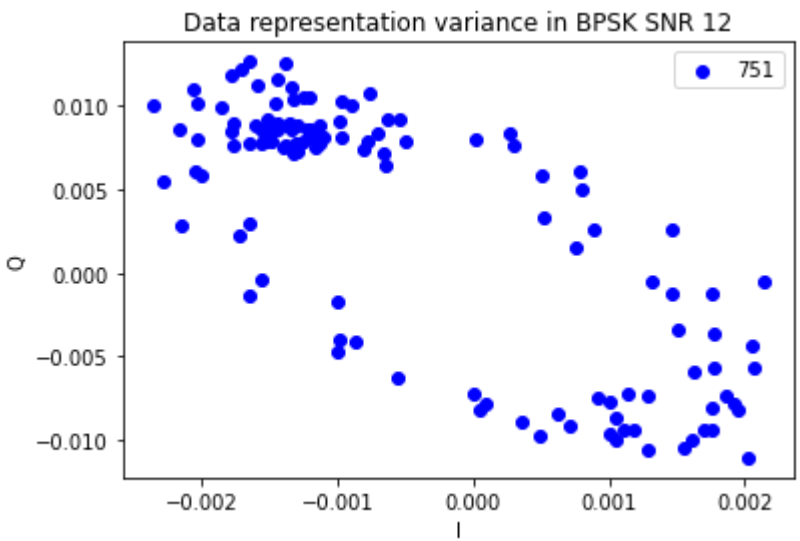
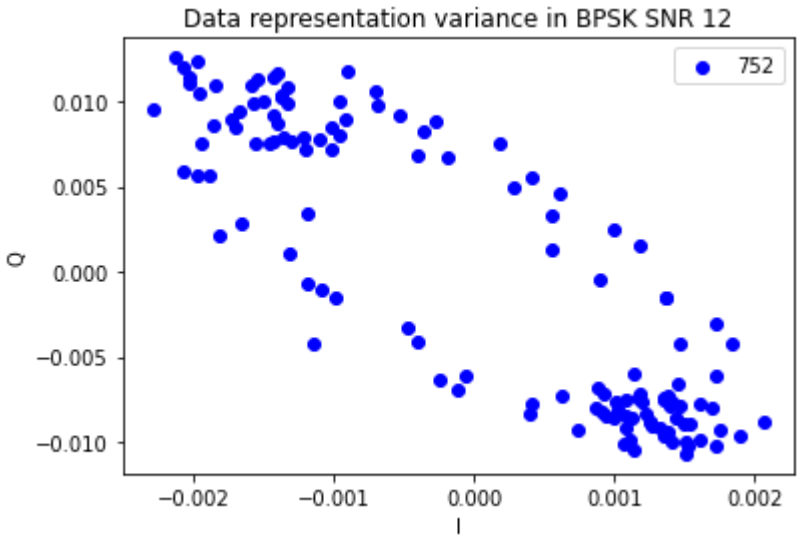
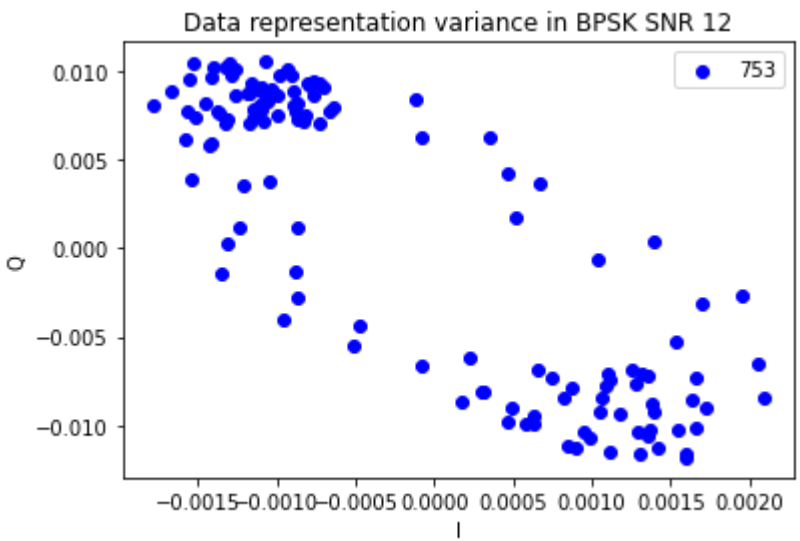
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
751
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
752
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
753
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
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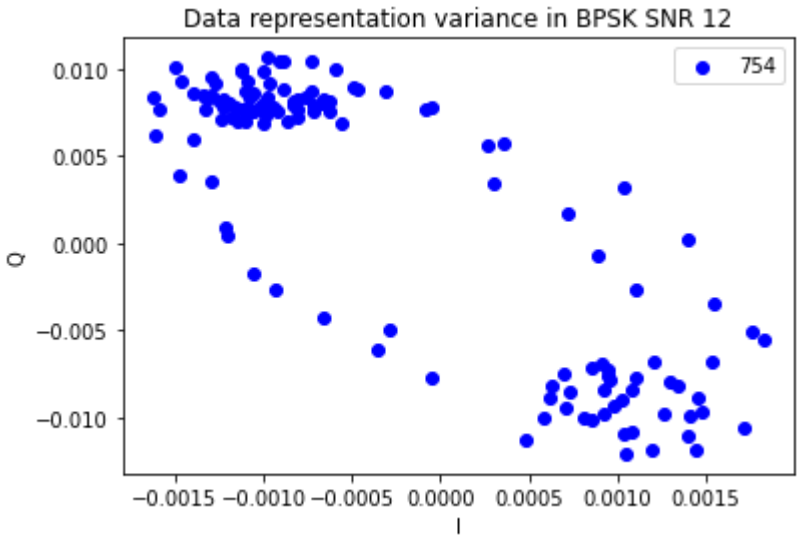
Data representation variance in BPSK SNR 12
754
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0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
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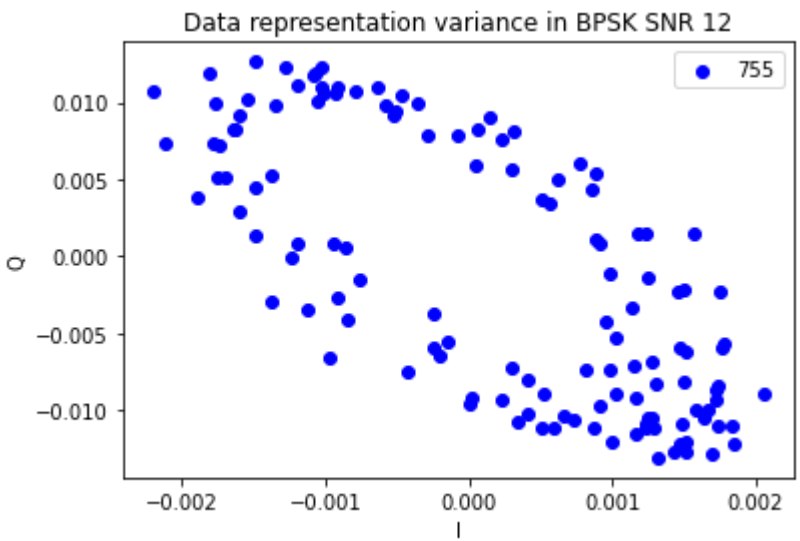
Data representation variance in BPSK SNR 12
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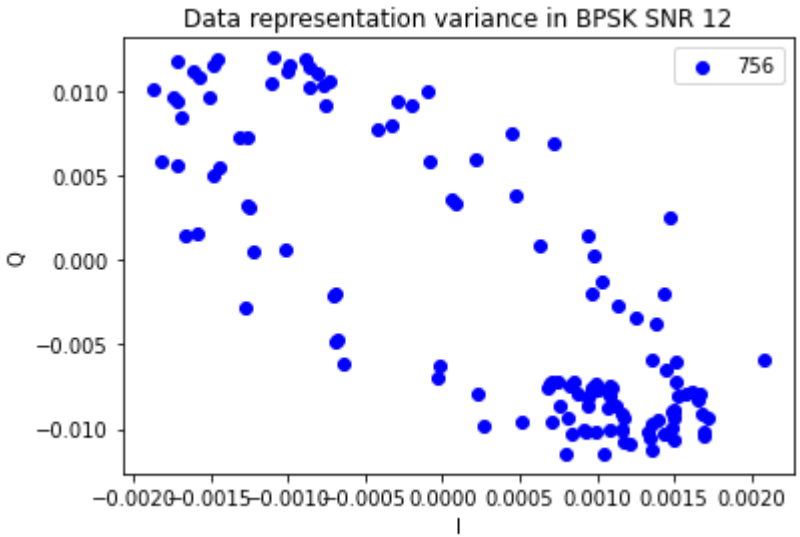
0.000
−0.005
−0.010
Q
−0.002 −0.001 0.000 0.001 0.002
I


Data representation variance in BPSK SNR 12
756
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
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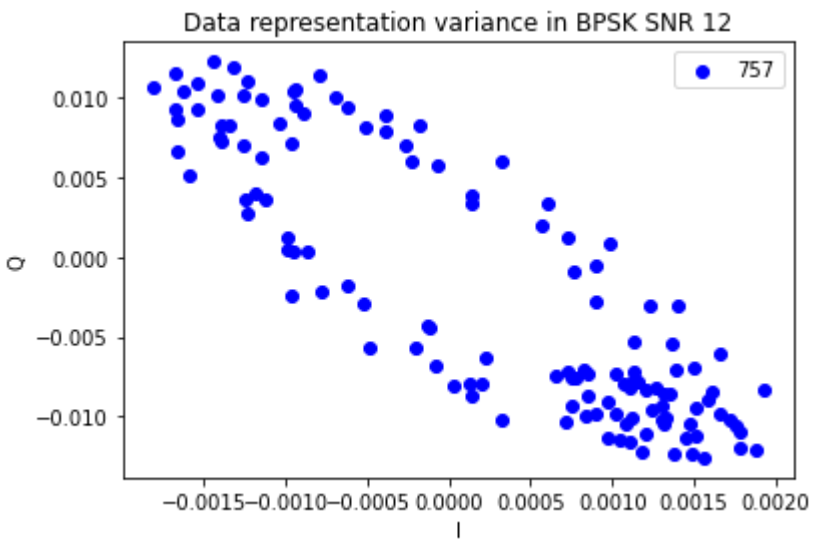
Data representation variance in BPSK SNR 12
757
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0.005
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−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
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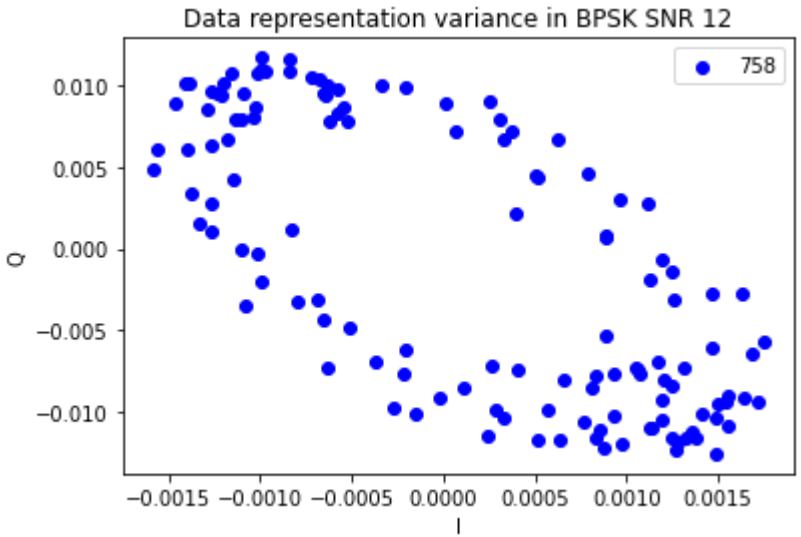
Data representation variance in BPSK SNR 12
758
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
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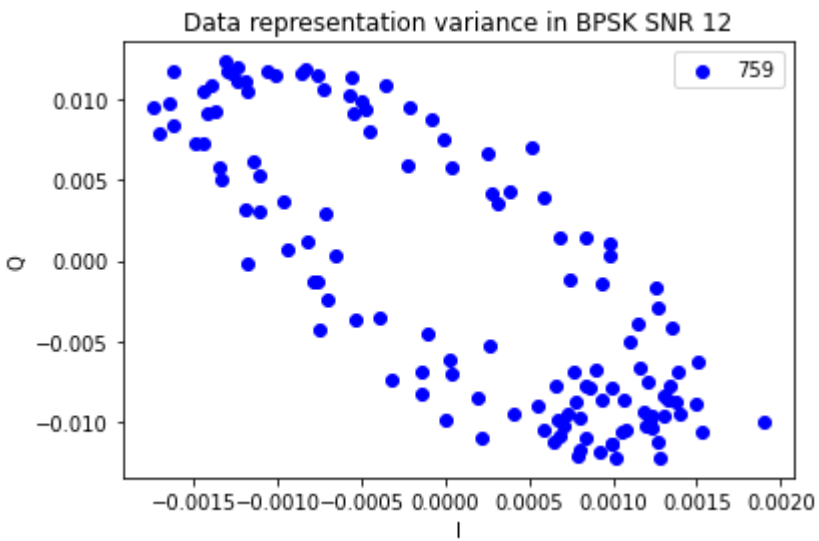
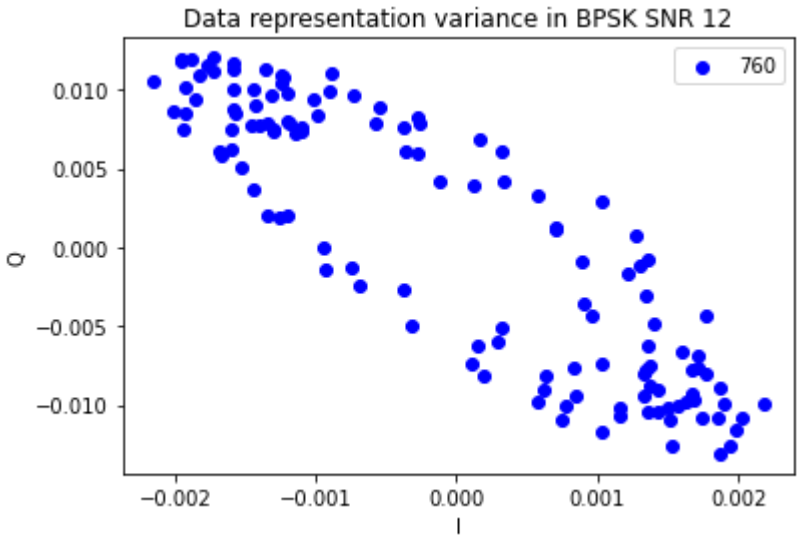
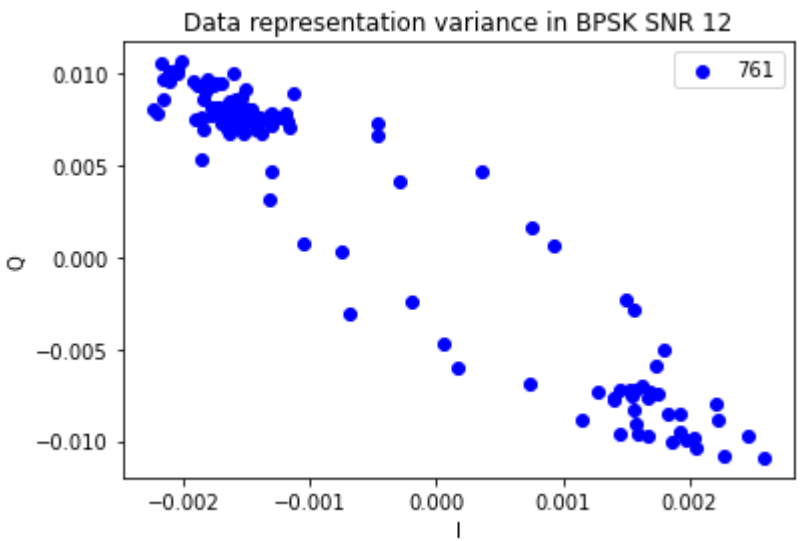
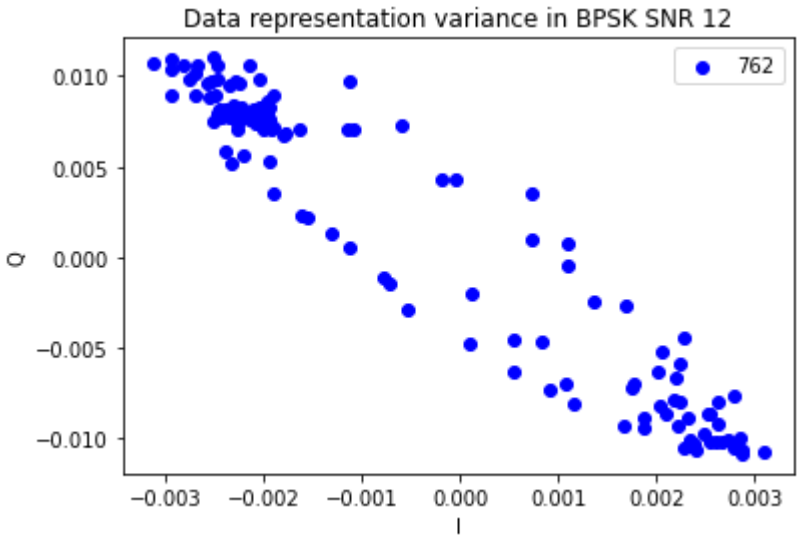

Data representation variance in BPSK SNR 12
759
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015−0.0010−0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I


Data representation variance in BPSK SNR 12
760
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
761
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
762
0.010
0.005
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−0.005
−0.010
Q
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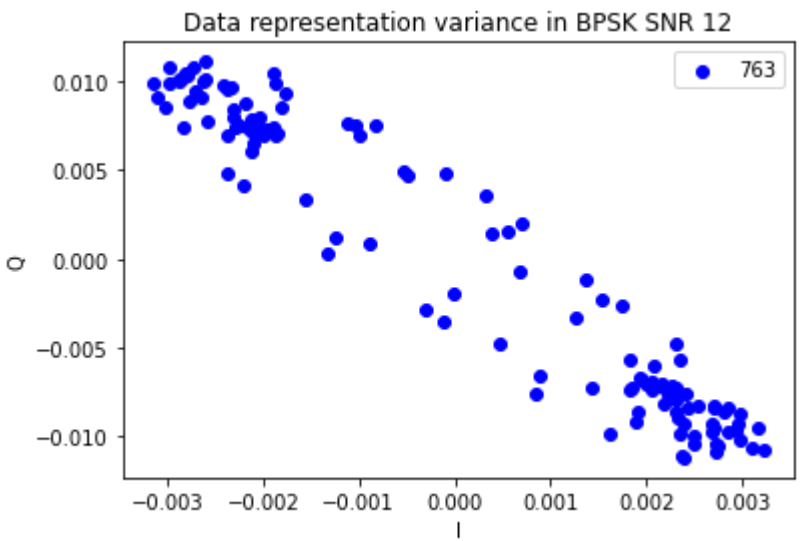
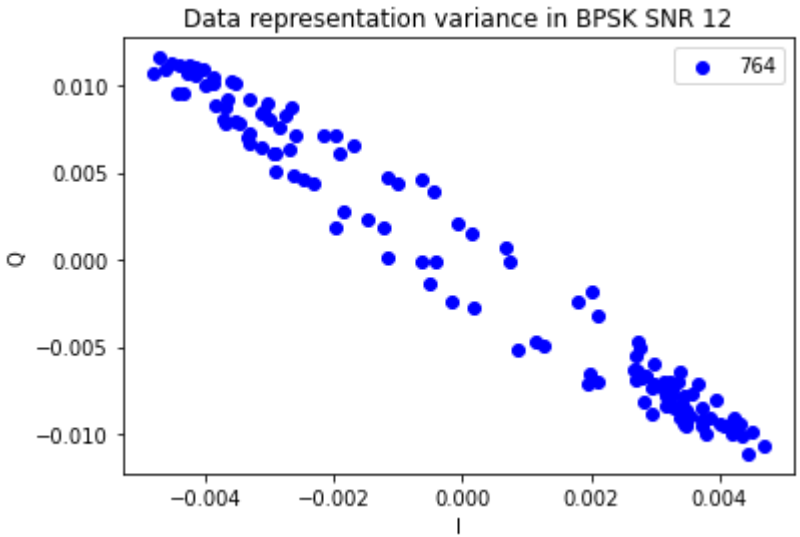
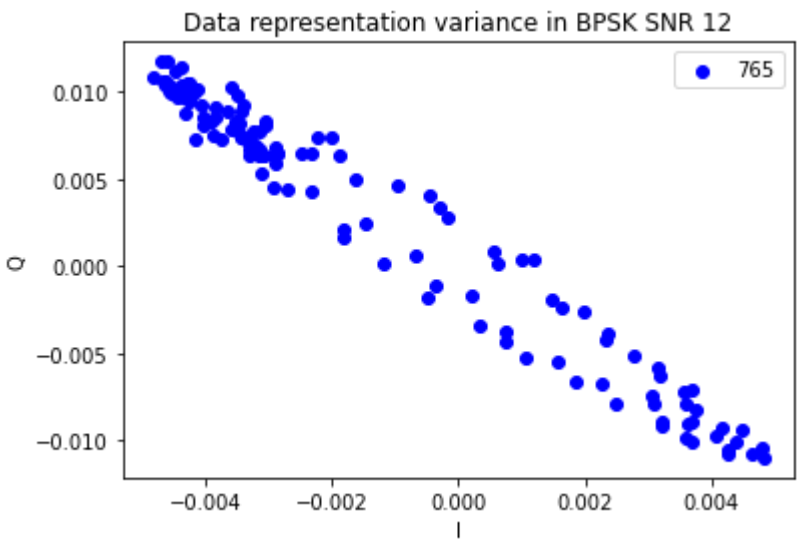
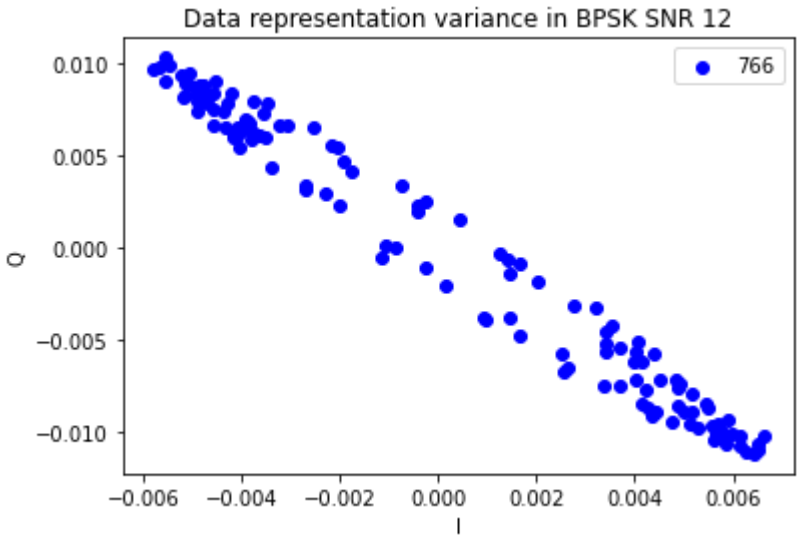
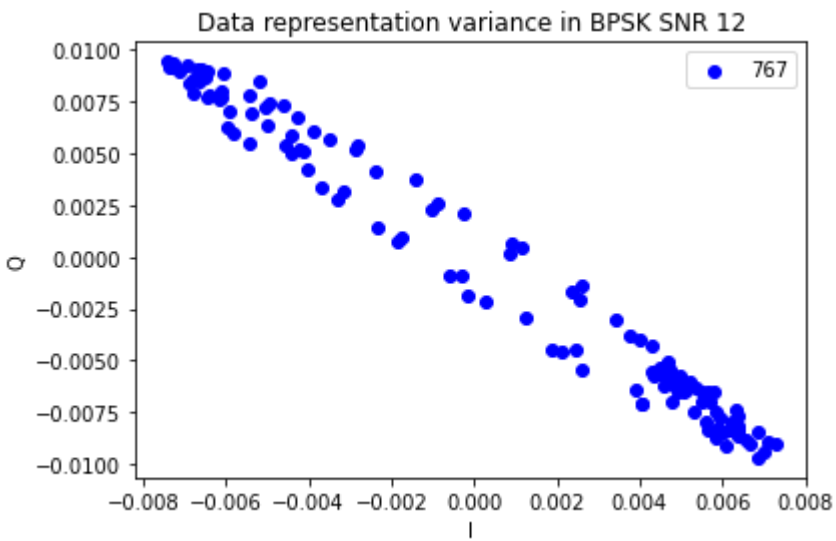
−0.002
−0.001
0.000
0.001
0.002
0.003
I

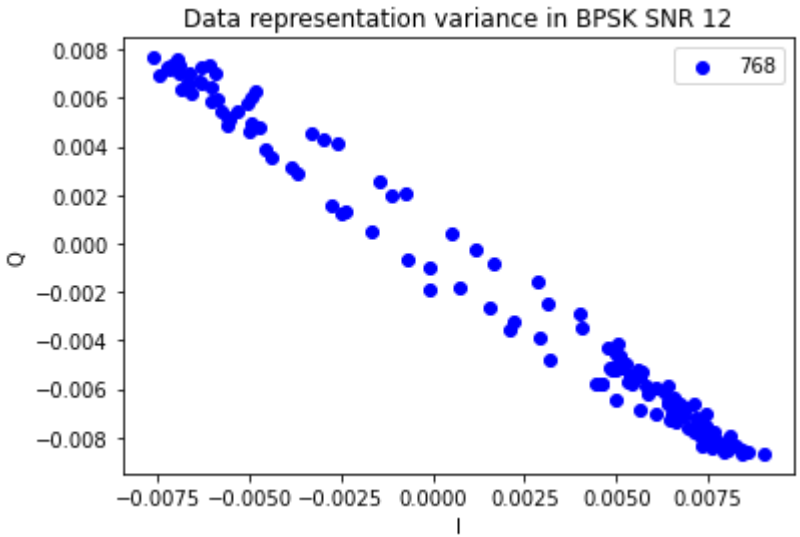

Data representation variance in BPSK SNR 12
763
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

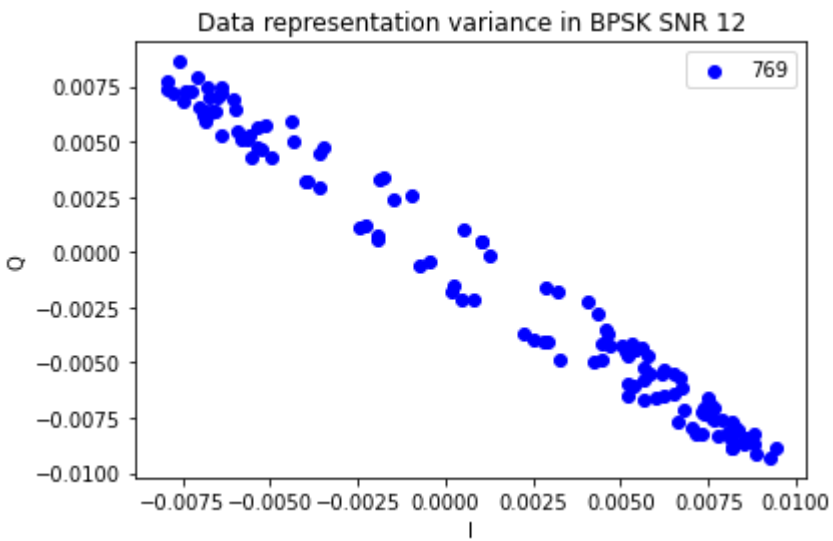

Data representation variance in BPSK SNR 12
764
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

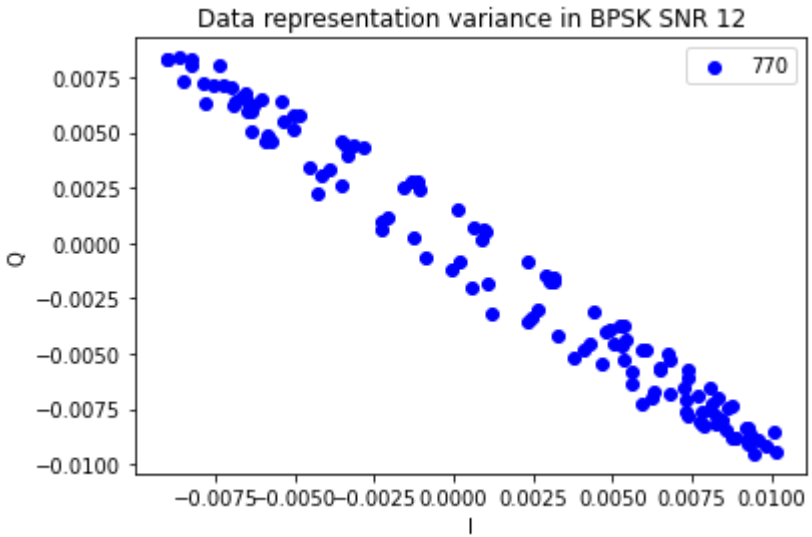

Data representation variance in BPSK SNR 12
765
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

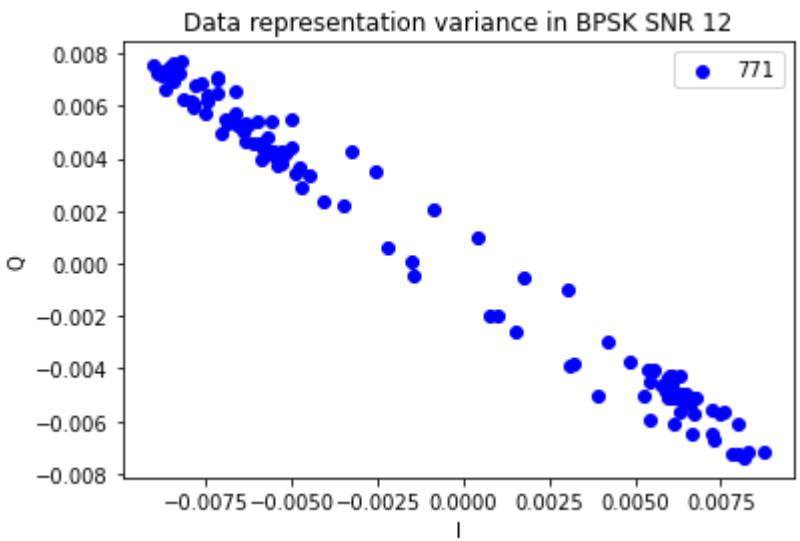

Data representation variance in BPSK SNR 12
766
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

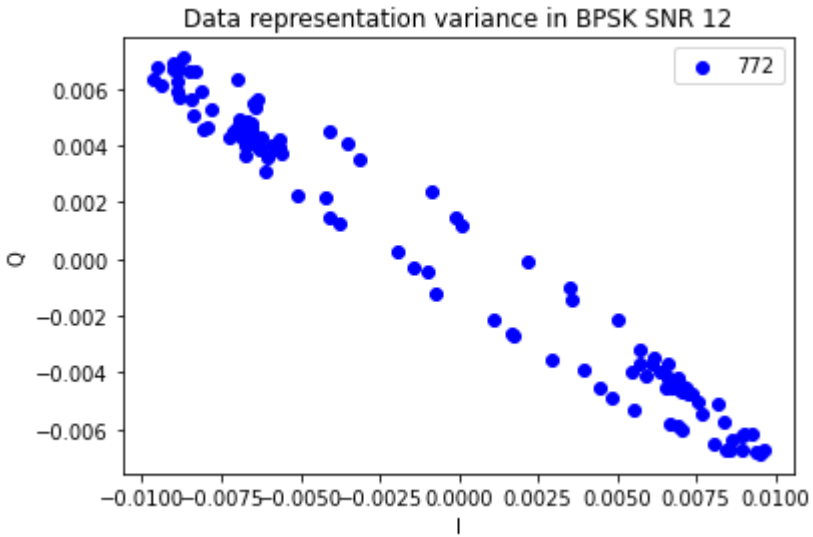

Data representation variance in BPSK SNR 12
767
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I

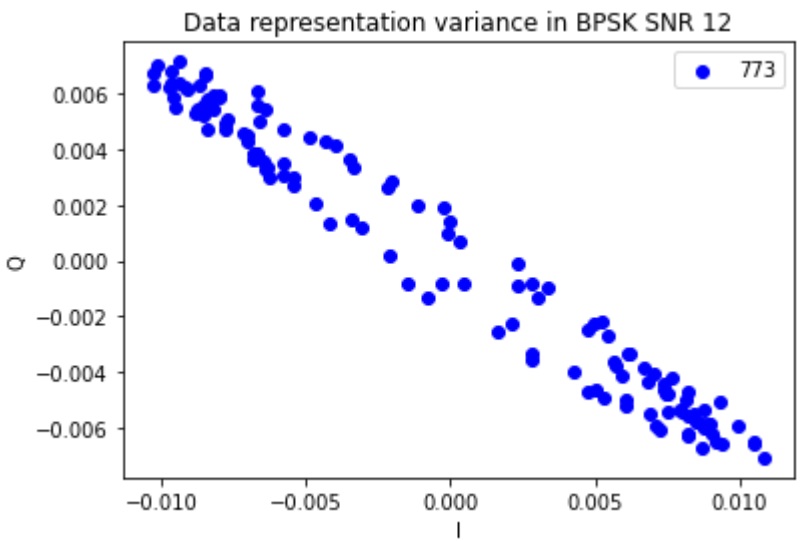

Data representation variance in BPSK SNR 12
768
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
769
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
770
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
771
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
772
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
773
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0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010 −0.005 0.000 0.005 0.010
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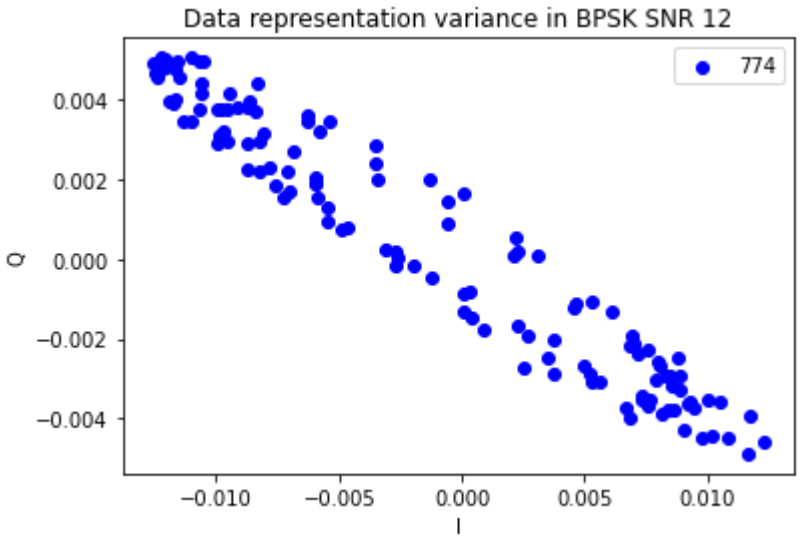
Data representation variance in BPSK SNR 12
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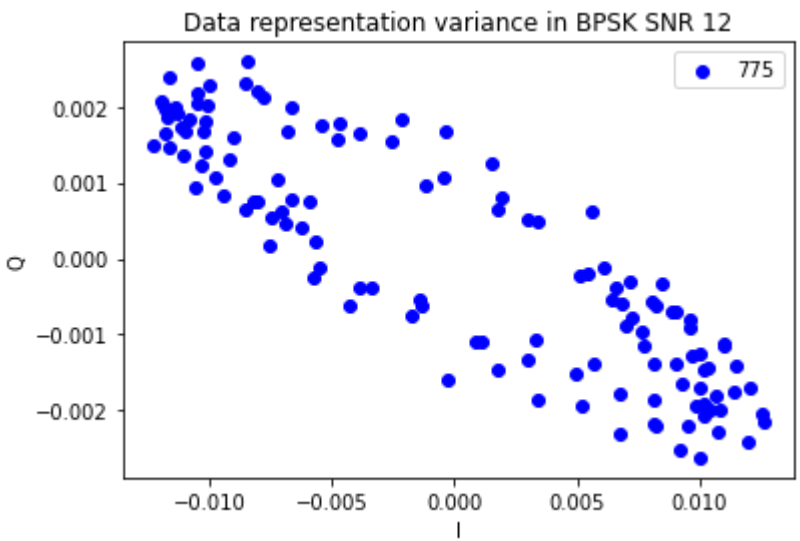
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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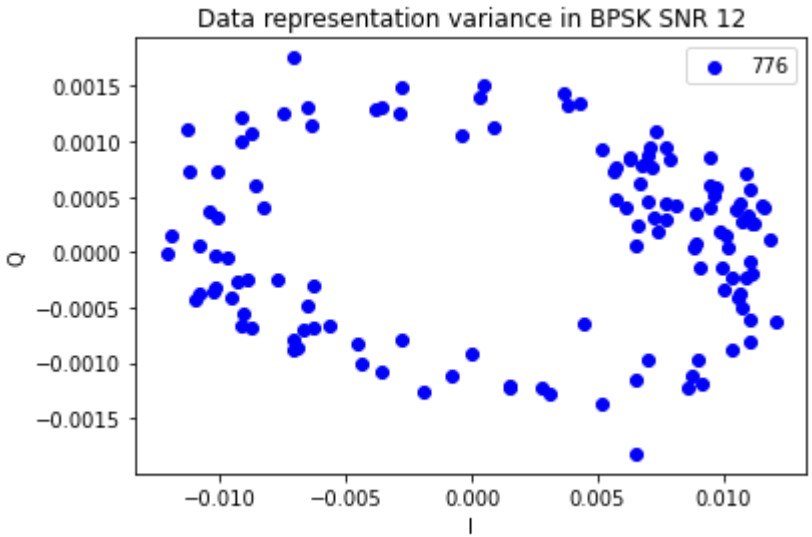
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
776
0.0015
0.0010
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0.0000
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−0.0010
−0.0015
Q
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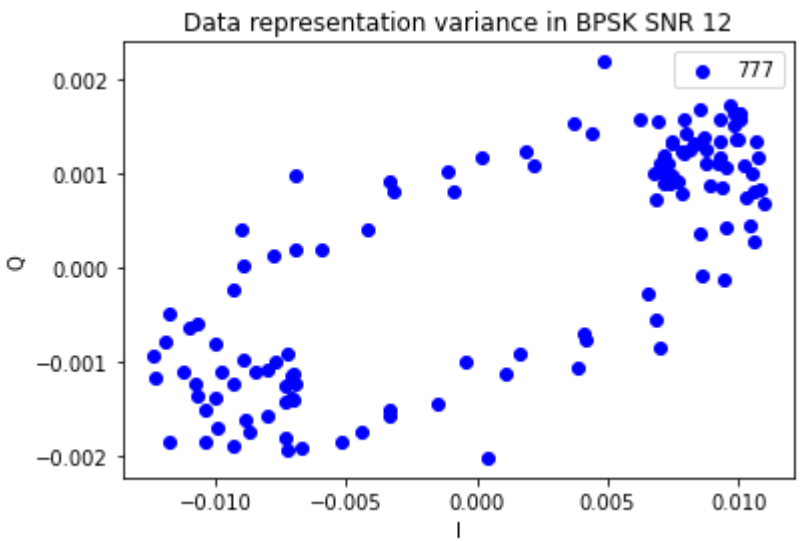
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
777
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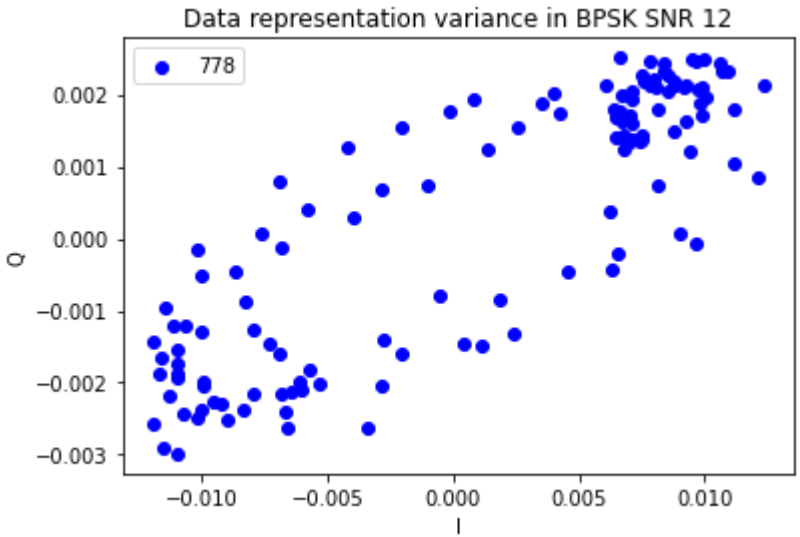
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
778
0.002
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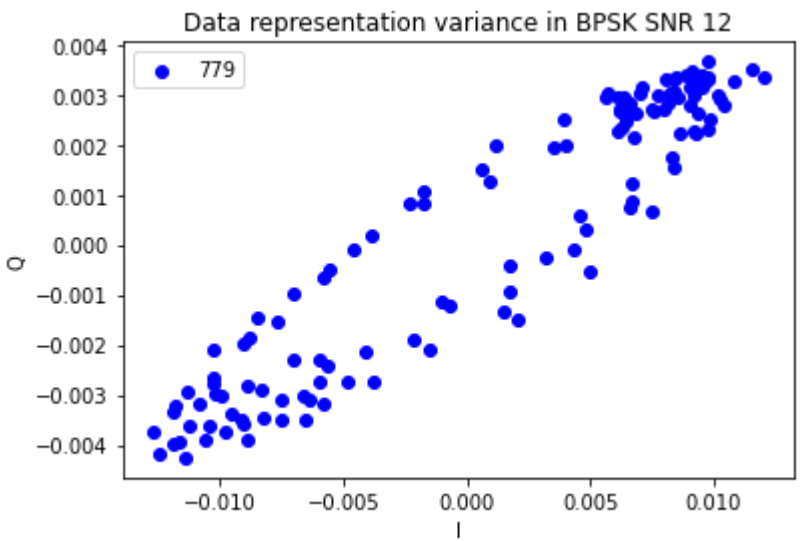
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
779
0.004
0.003
0.002
0.001
0.000
−0.001
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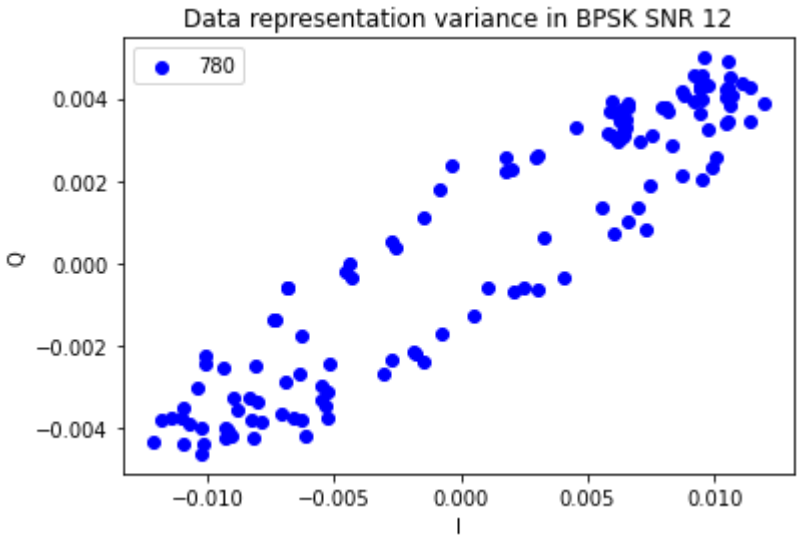
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
780
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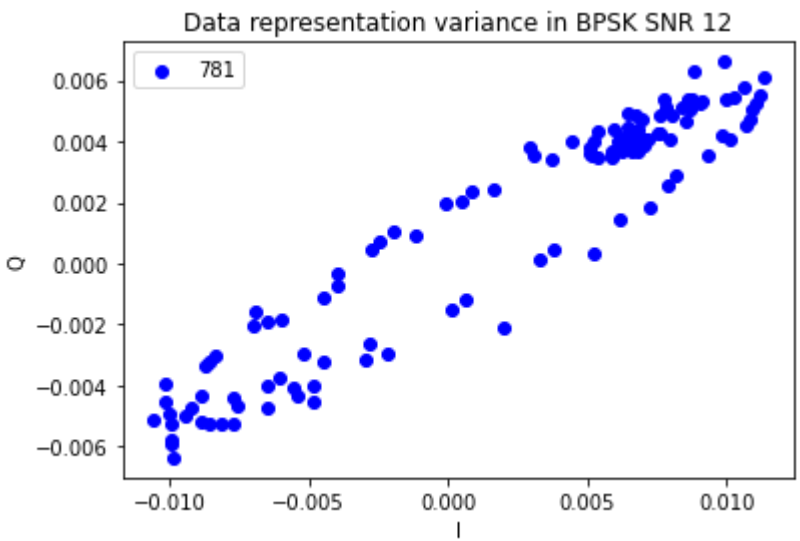
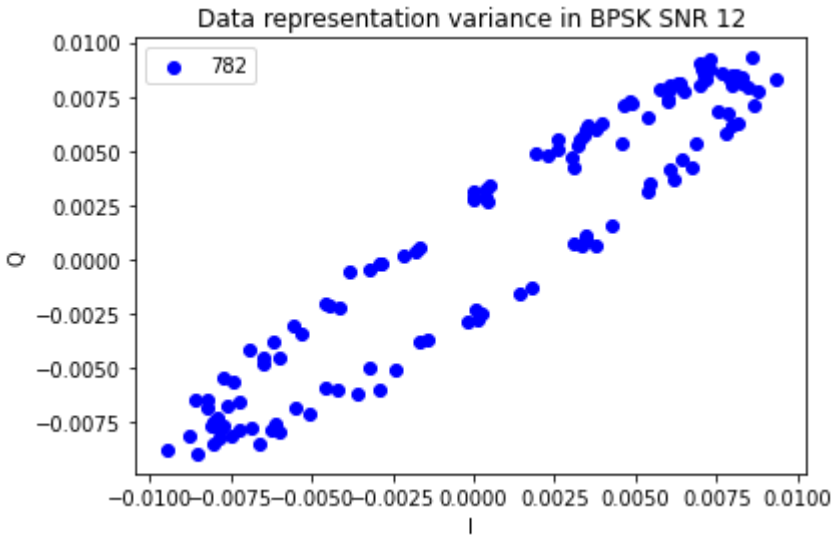
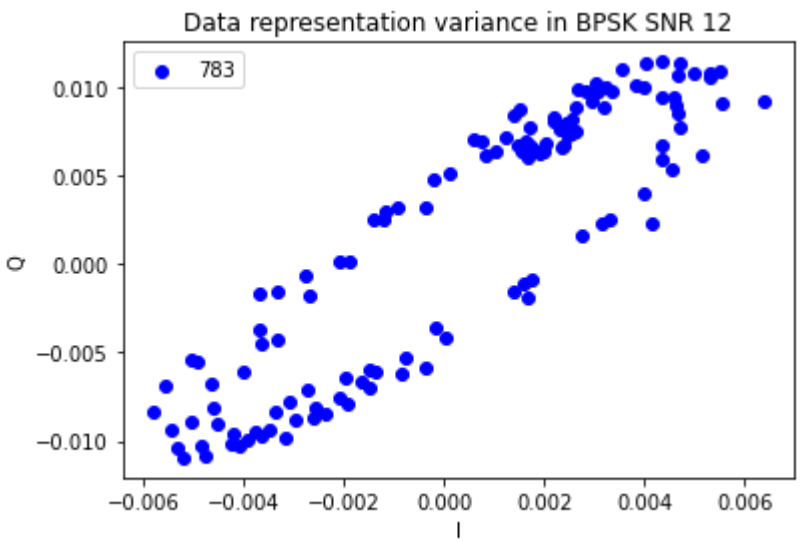
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
781
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
782
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
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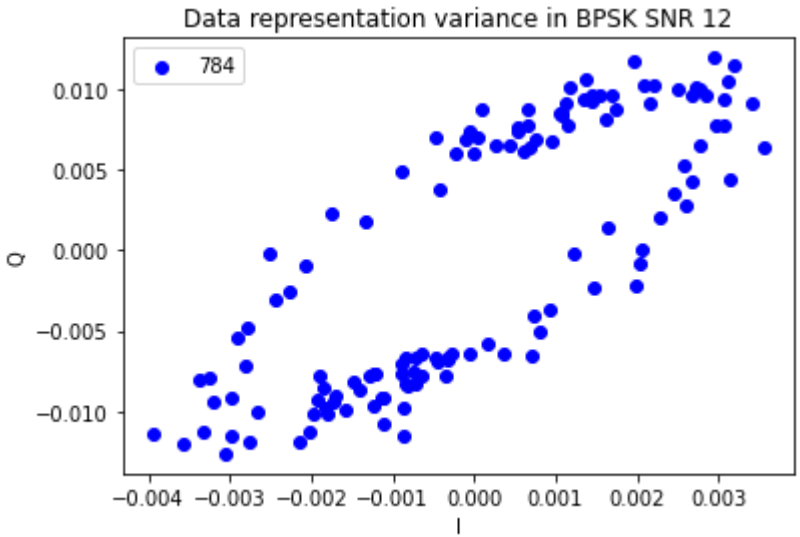
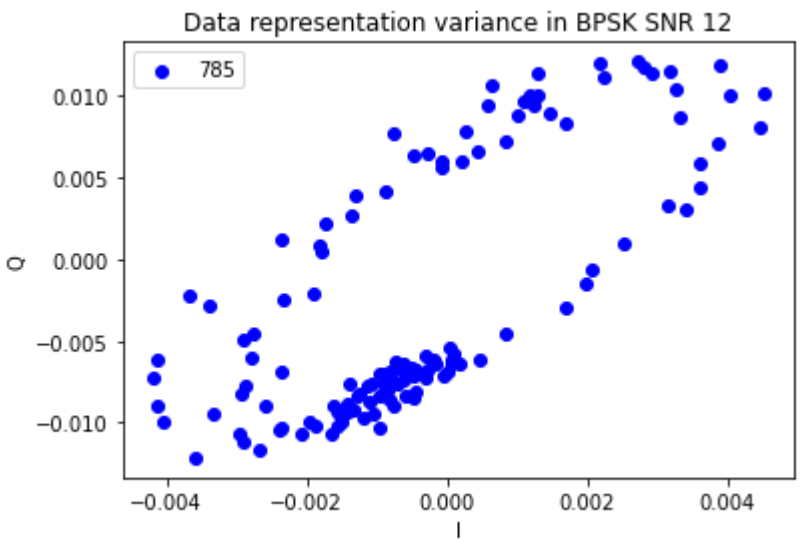
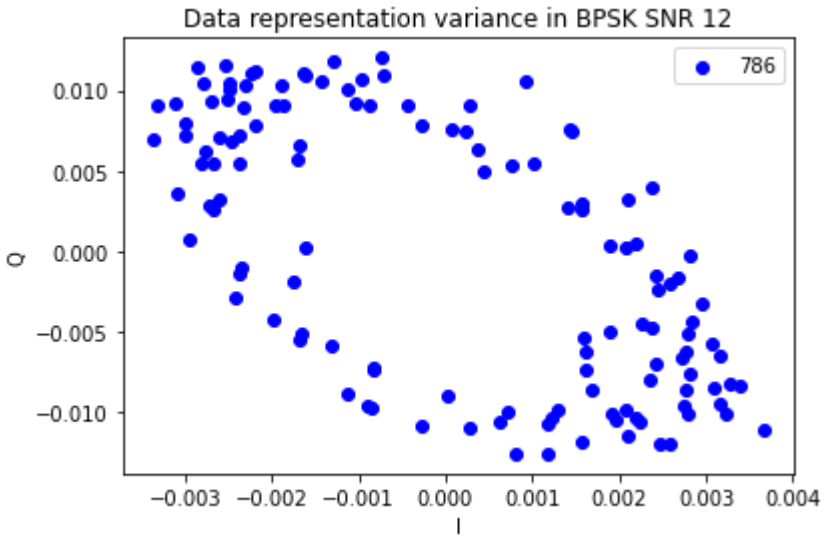
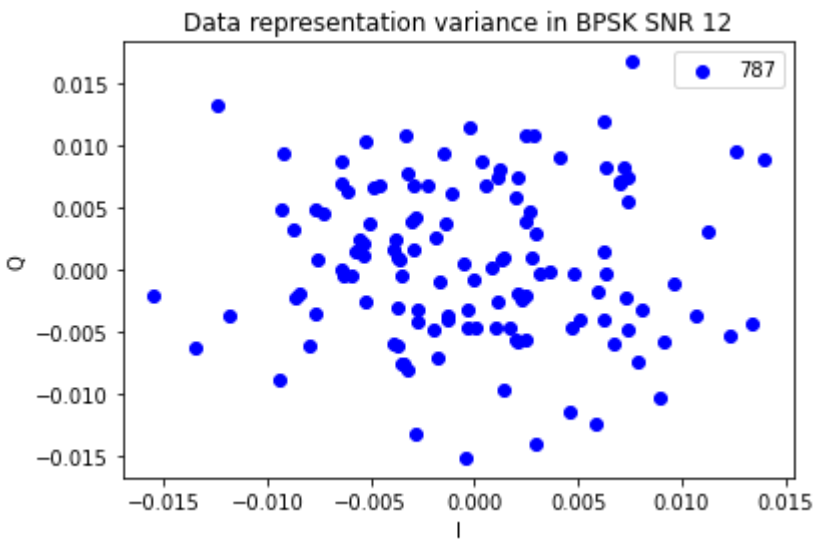
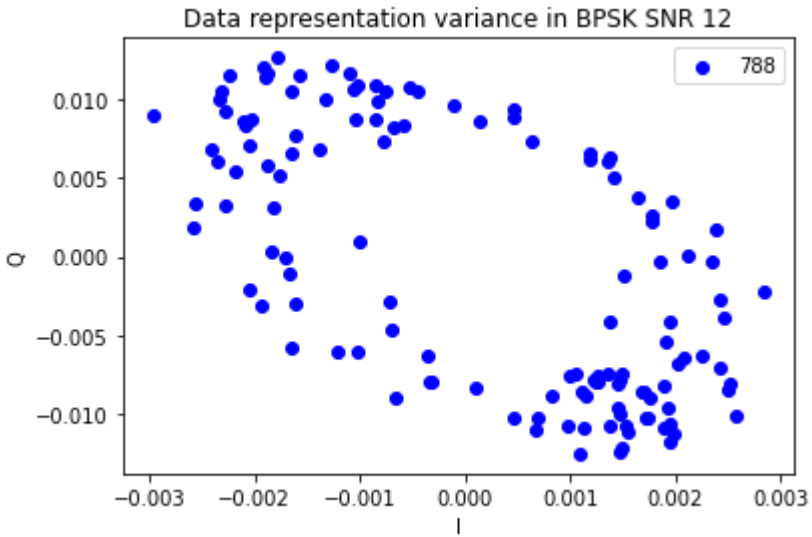
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I

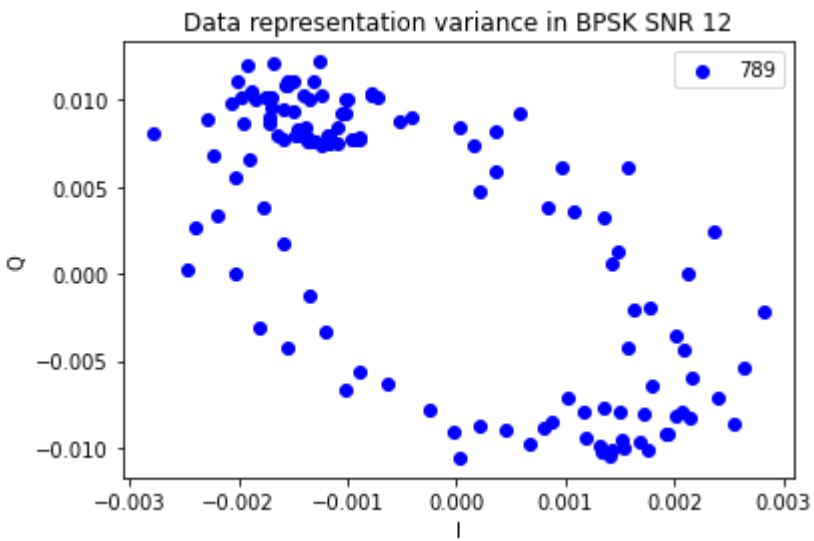

Data representation variance in BPSK SNR 12
784
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I


Data representation variance in BPSK SNR 12
785
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I


Data representation variance in BPSK SNR 12
786
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I


Data representation variance in BPSK SNR 12
787
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.015
−0.010
−0.005
0.000
0.005
0.010
0.015
I


Data representation variance in BPSK SNR 12
788
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
789
0.010
0.005
0.000
−0.005
−0.010
Q
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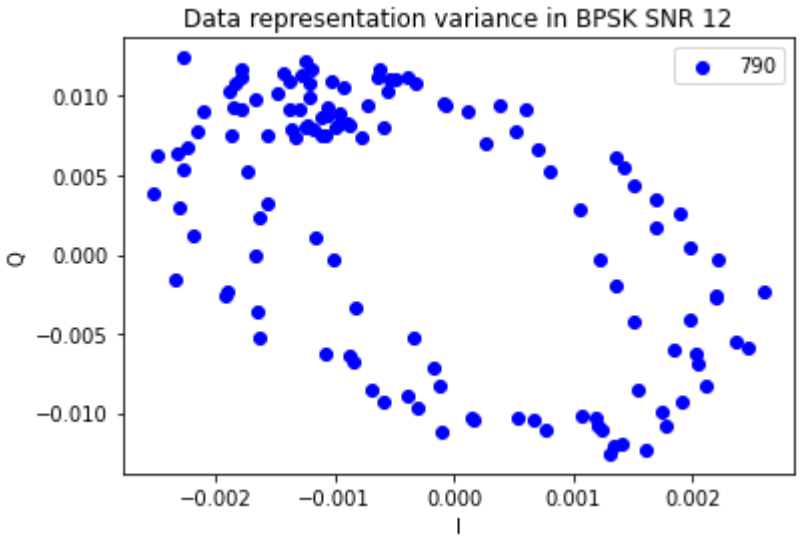
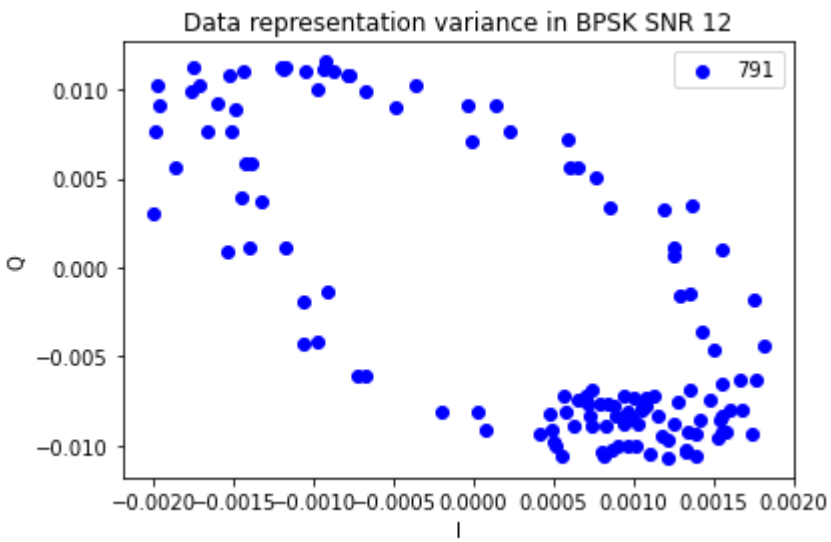
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
790
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
791
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.0015
−0.0010
−0.0005
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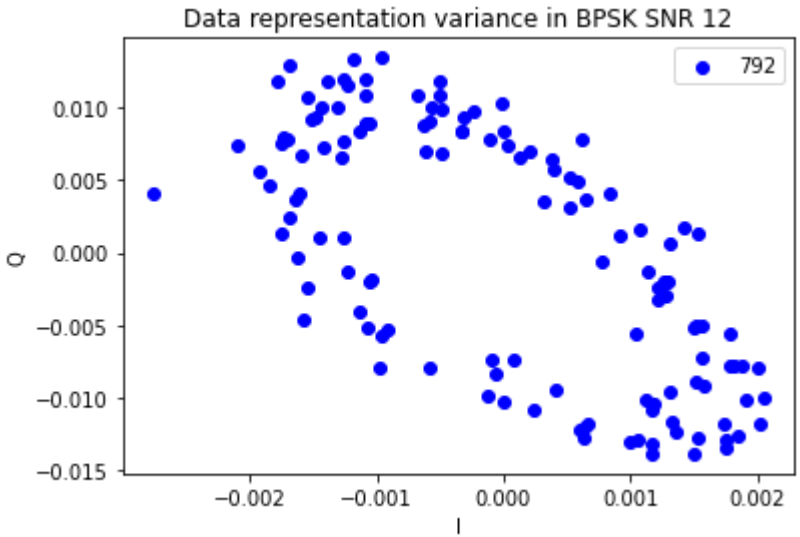
Data representation variance in BPSK SNR 12
792
0.010
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0.000
−0.005
−0.010
−0.015
Q
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−0.001
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0.001
0.002
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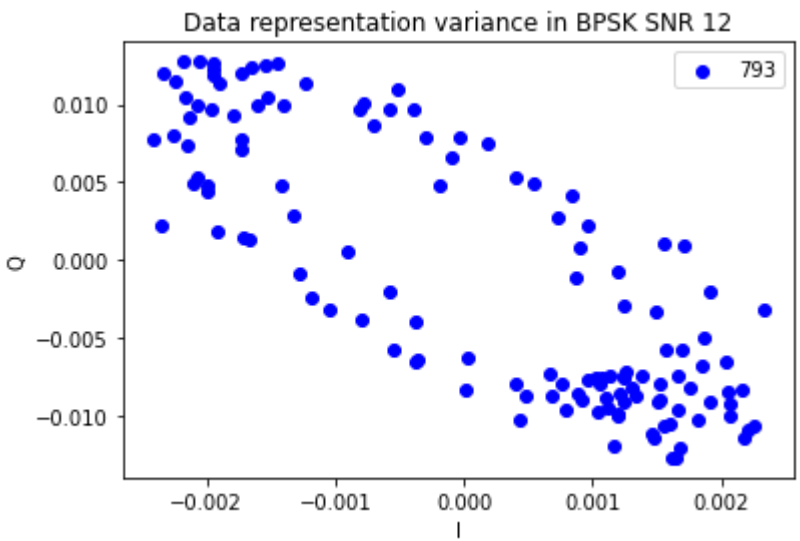
Data representation variance in BPSK SNR 12
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0.005
0.000
−0.005
−0.010
Q
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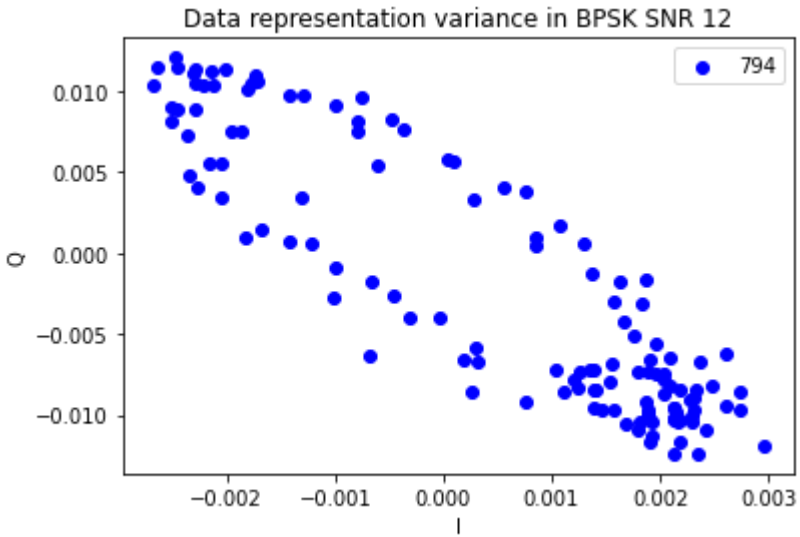
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
794
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
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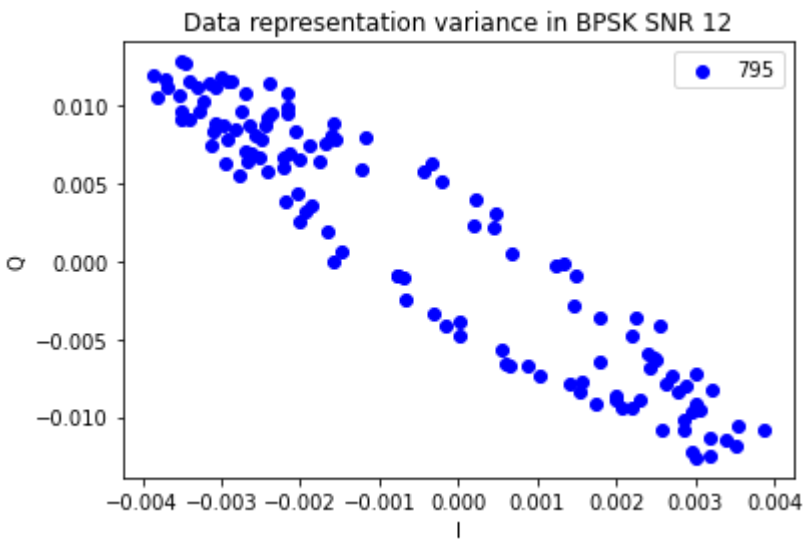
Data representation variance in BPSK SNR 12
795
0.010
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0.000
−0.005
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−0.003
−0.002
−0.001
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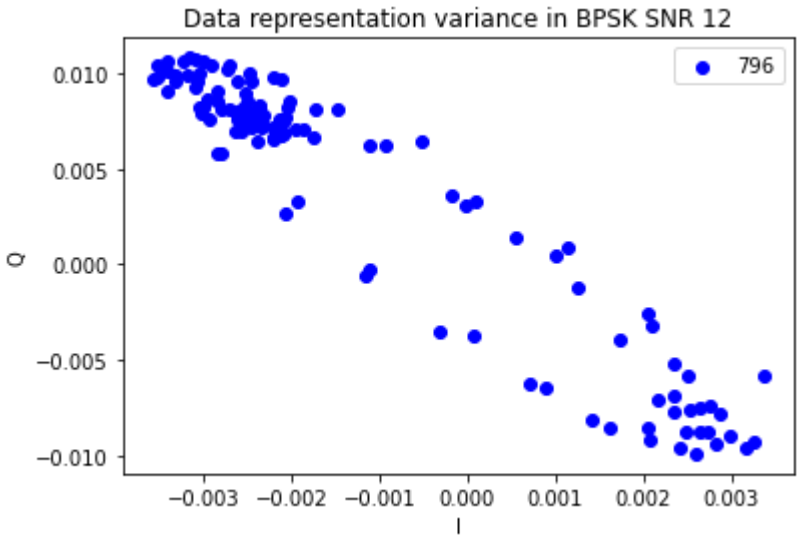
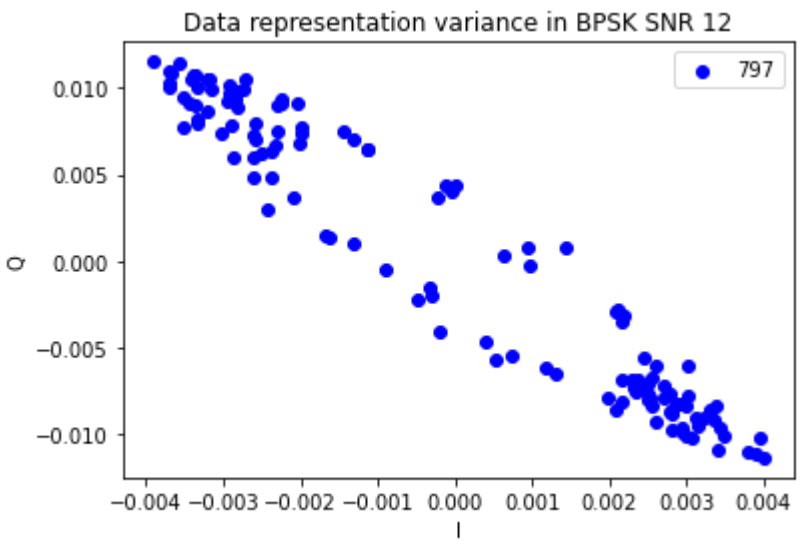
0.001
0.002
0.003
0.004
I


Data representation variance in BPSK SNR 12
796
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
797
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.003
−0.002
−0.001
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0.001
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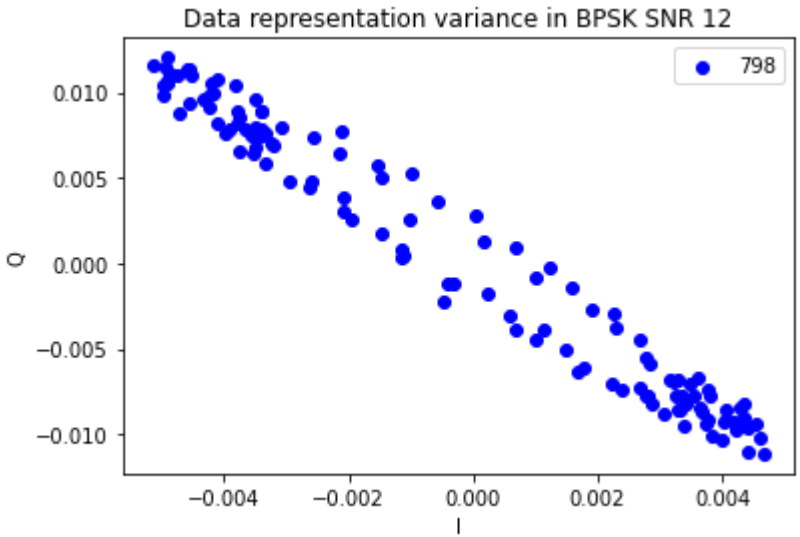
0.004
I


Data representation variance in BPSK SNR 12
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0.005
0.000
−0.005
−0.010
Q
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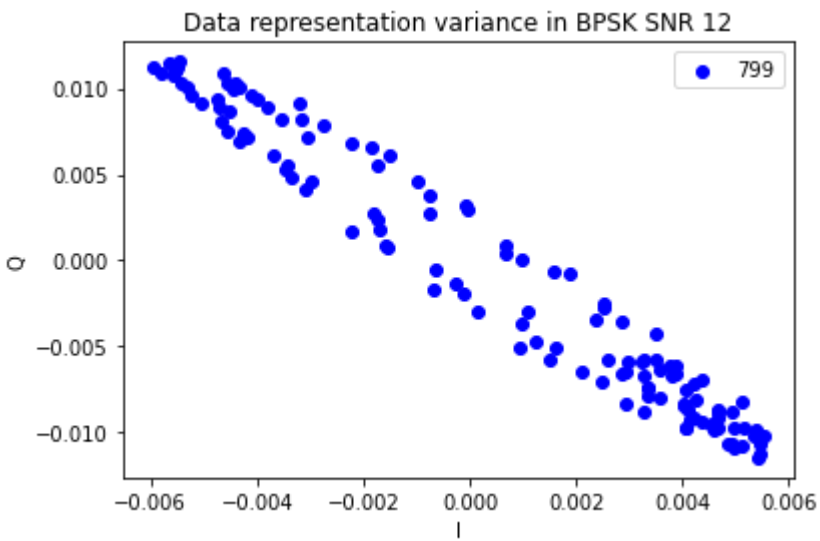
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
799
0.010
0.005
0.000
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−0.010
Q
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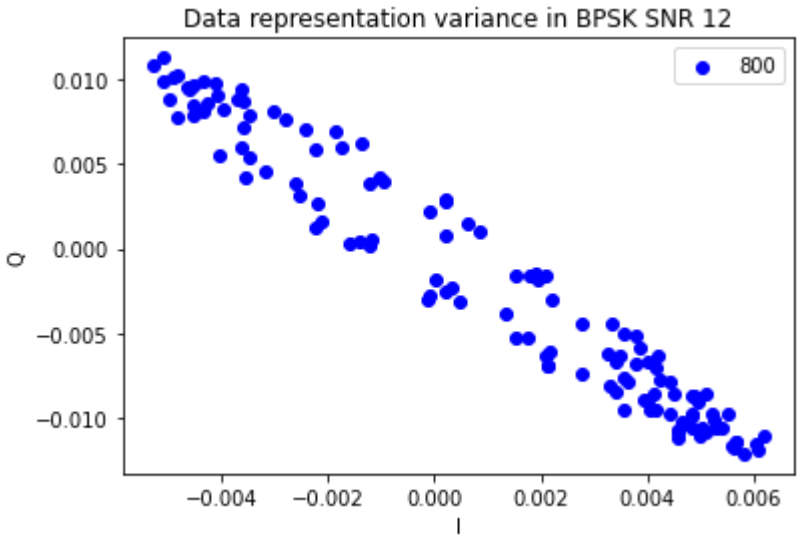
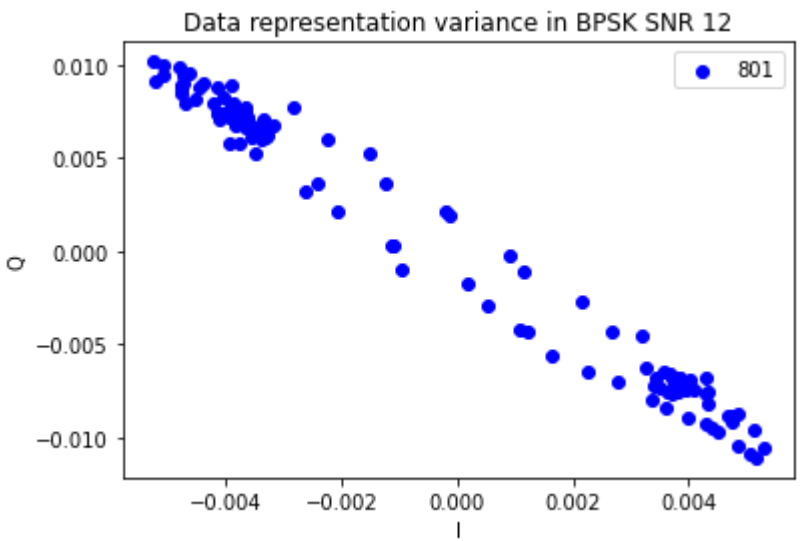
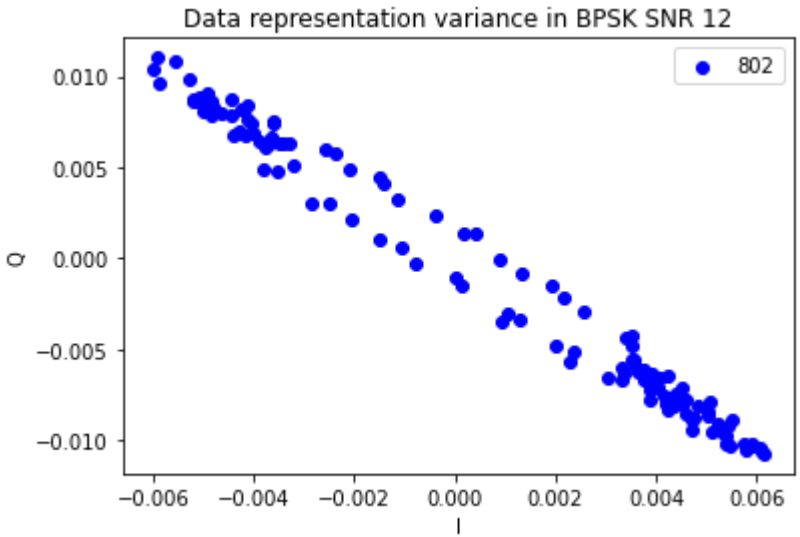
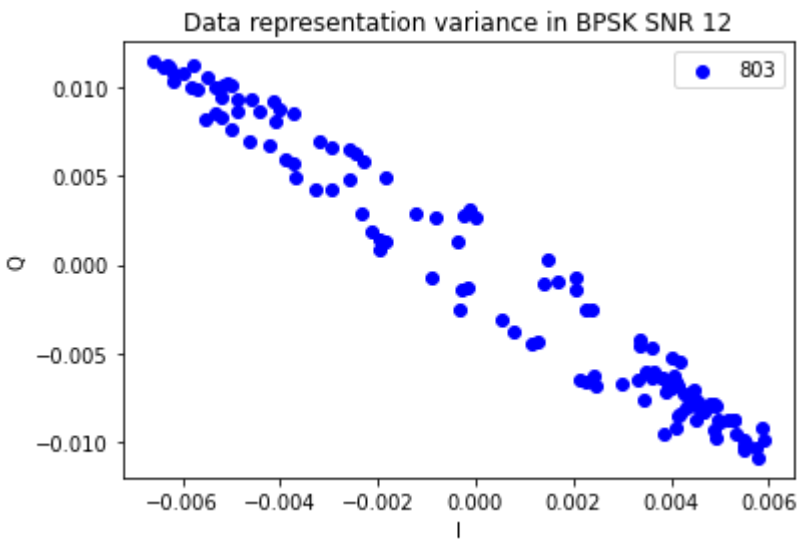
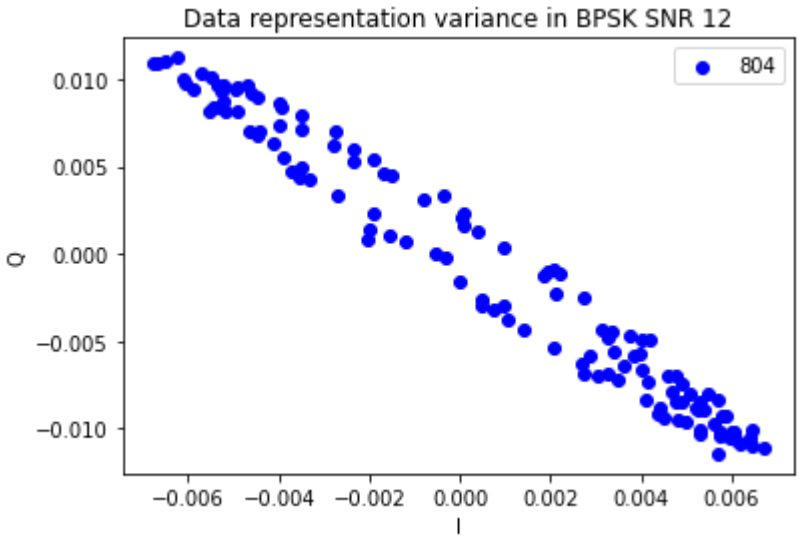
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
800
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
801
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
802
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
803
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
804
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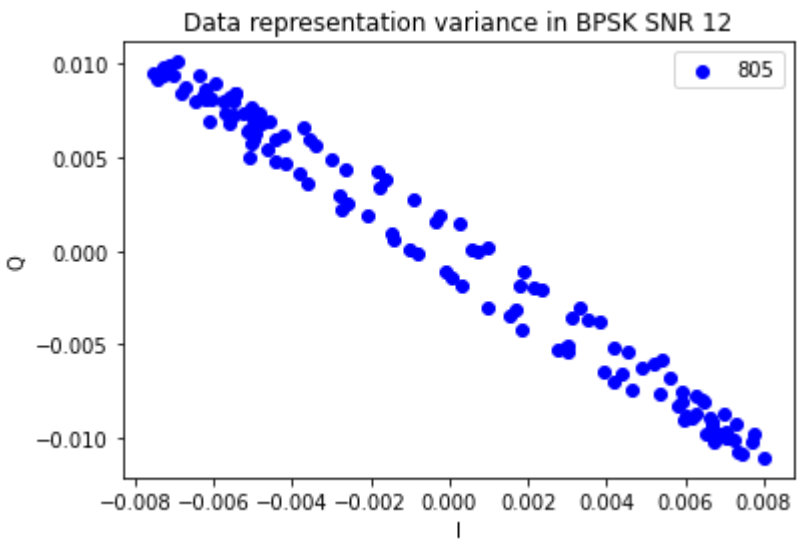
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
805
0.010
0.005
0.000
−0.005
−0.010
Q
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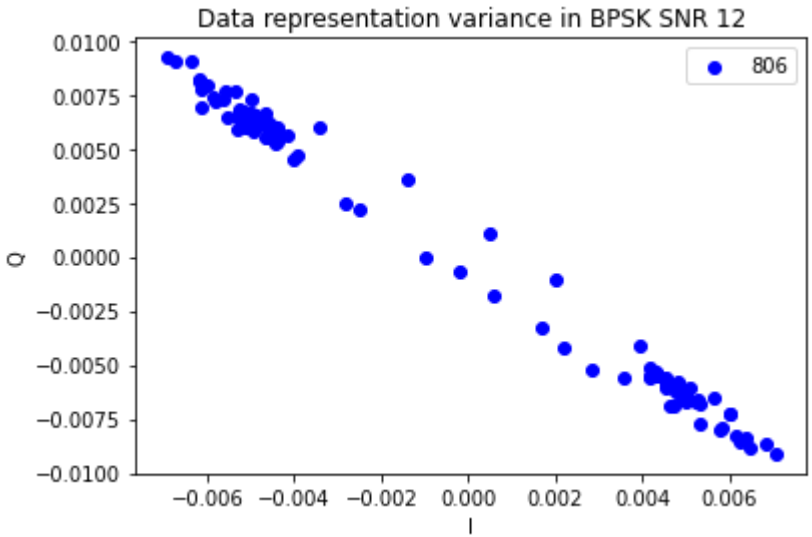
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I


Data representation variance in BPSK SNR 12
806
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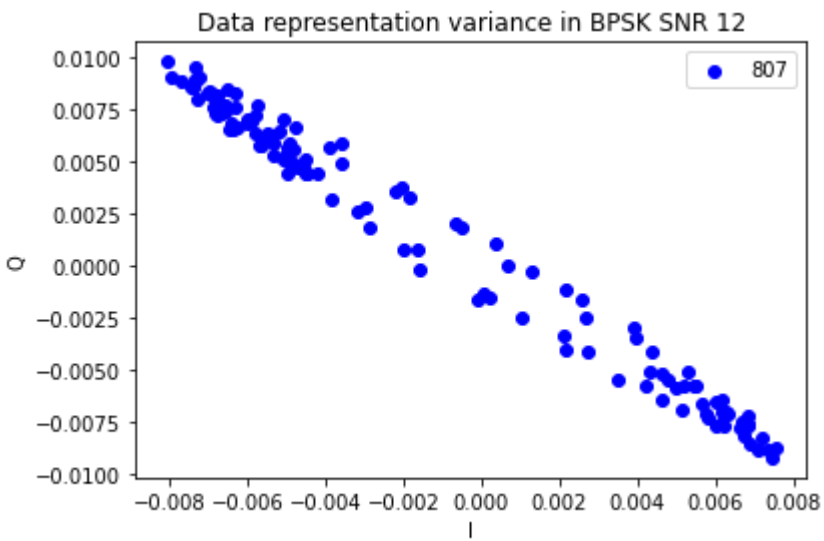
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
807
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
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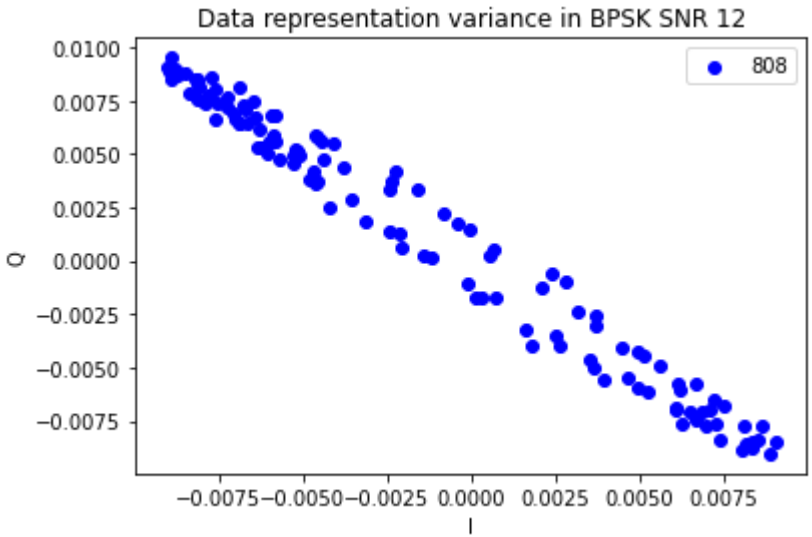
Data representation variance in BPSK SNR 12
808
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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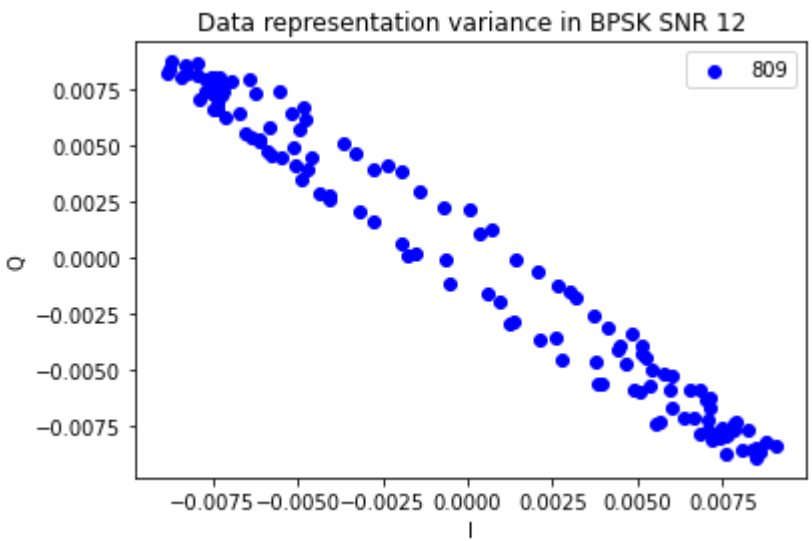
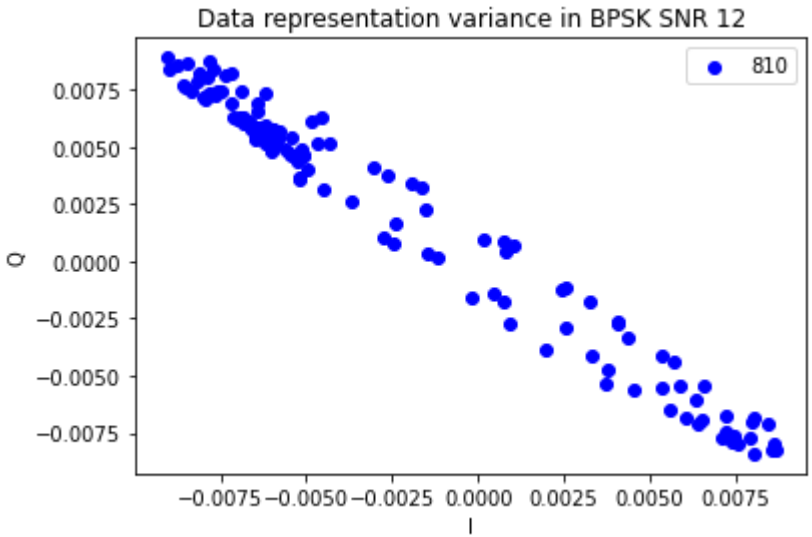

Data representation variance in BPSK SNR 12
809
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
810
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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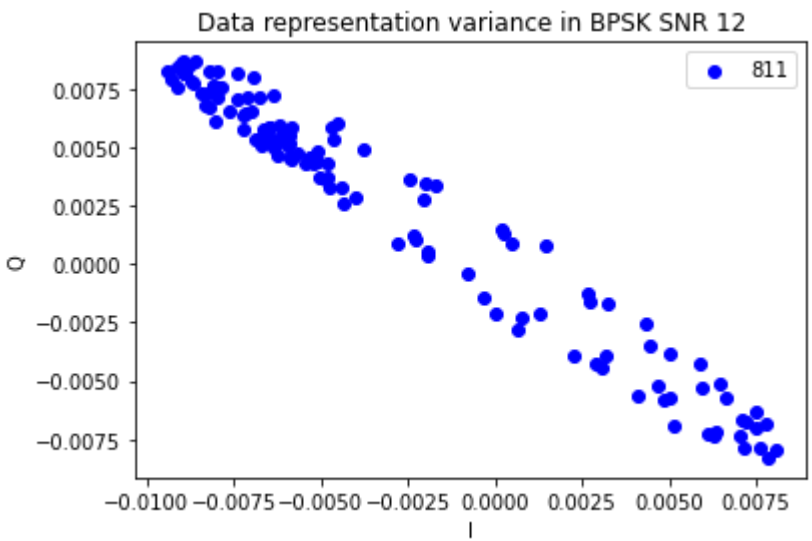
Data representation variance in BPSK SNR 12
811
0.0075
0.0050
0.0025
0.0000
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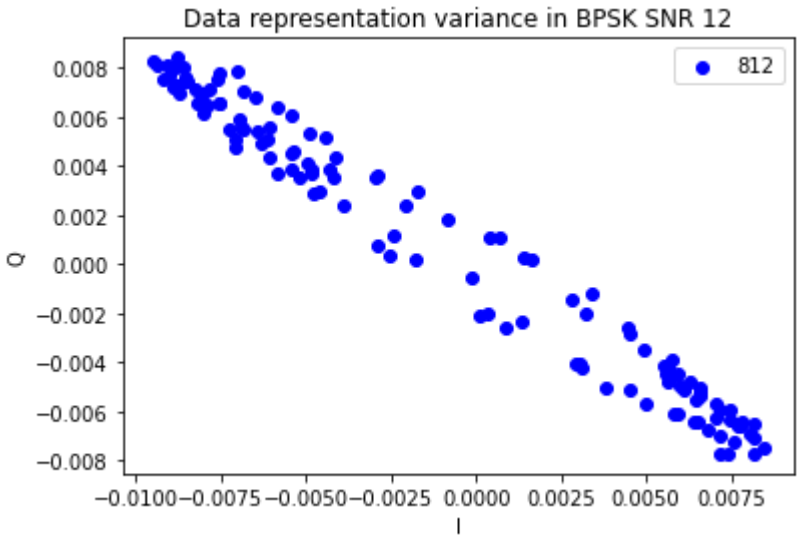
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
812
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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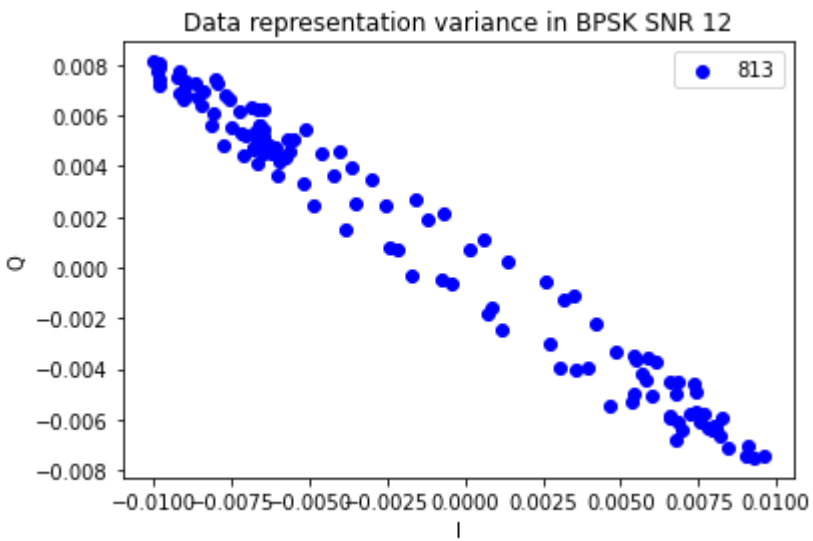
Data representation variance in BPSK SNR 12
813
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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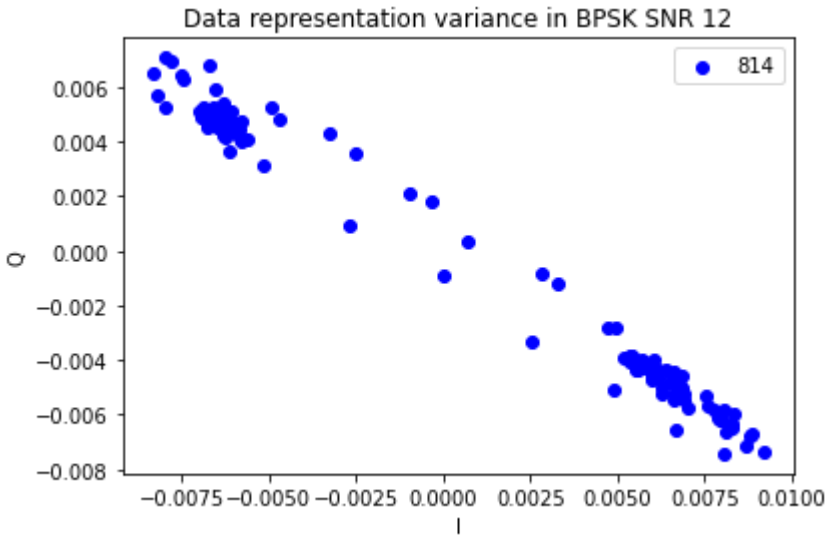
Data representation variance in BPSK SNR 12
814
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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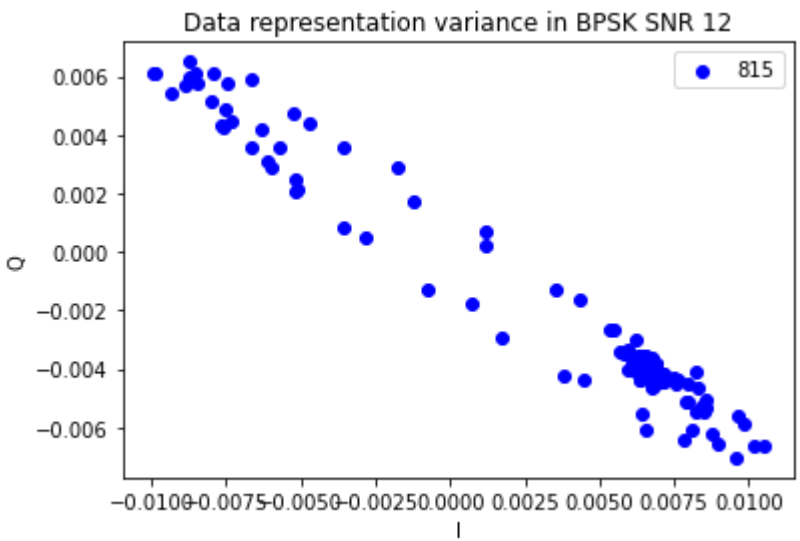
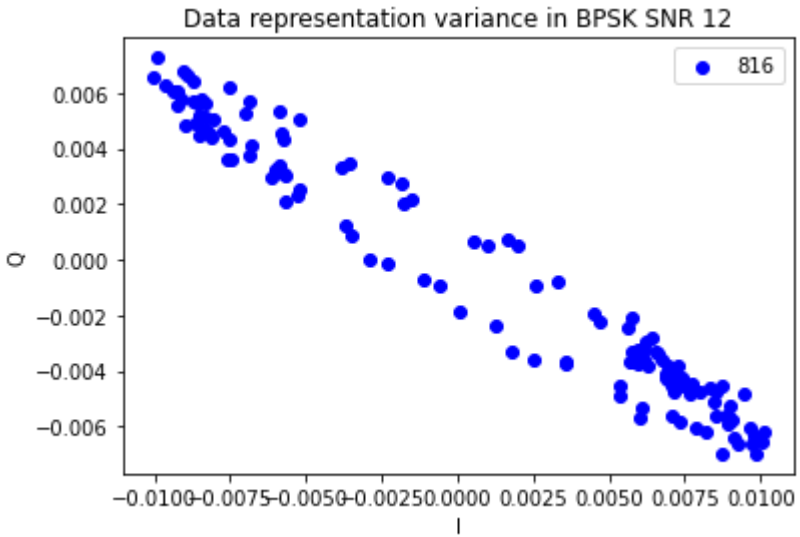
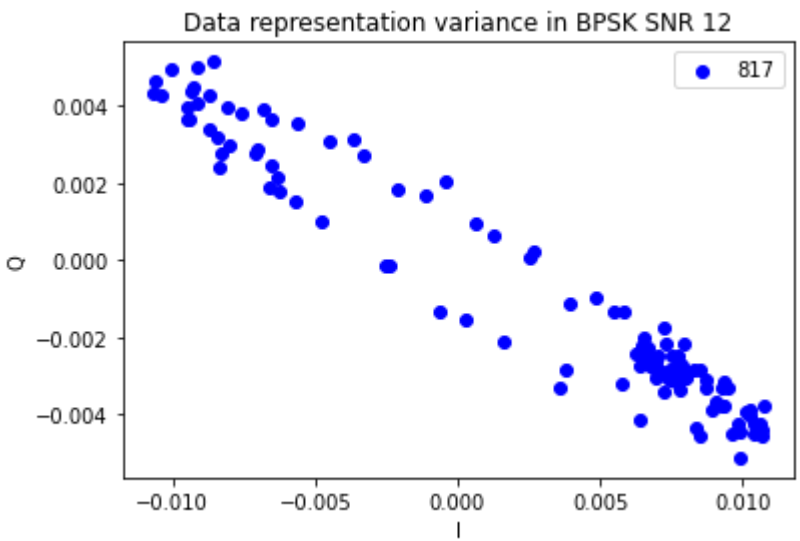
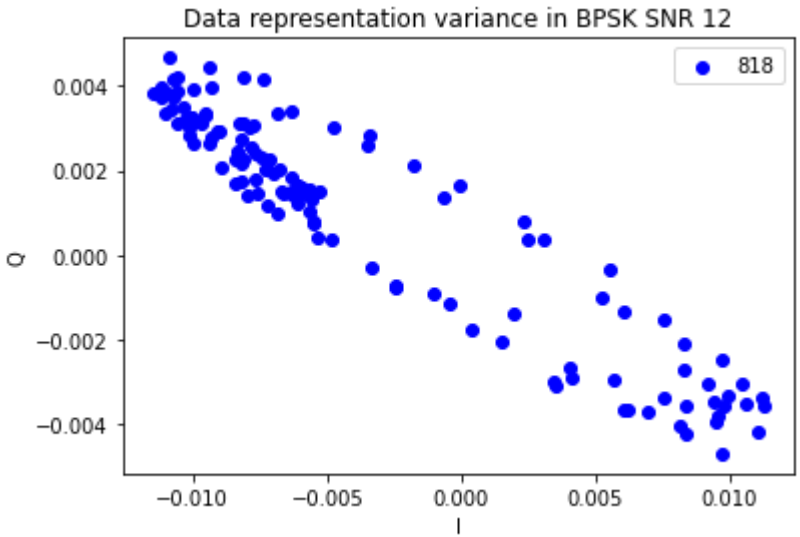
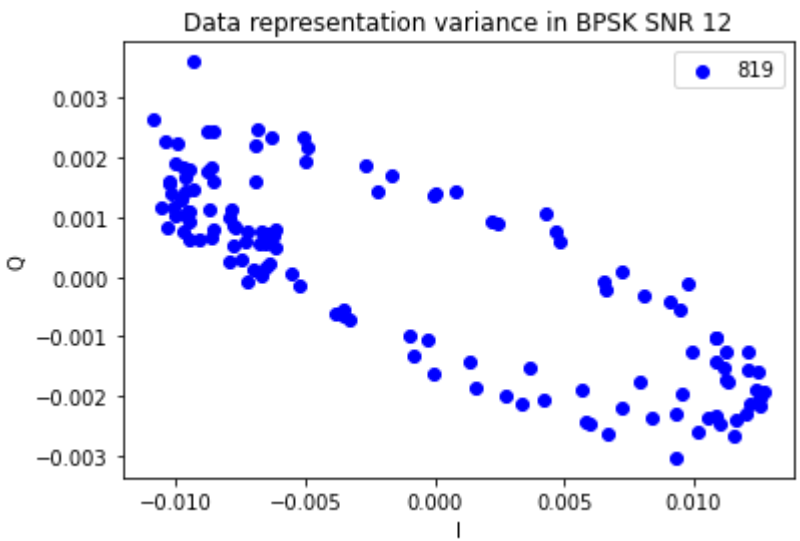
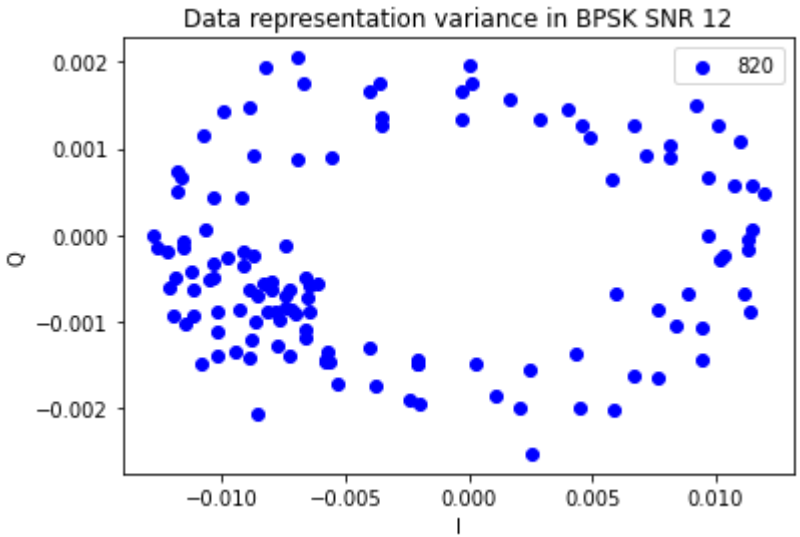

Data representation variance in BPSK SNR 12
815
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

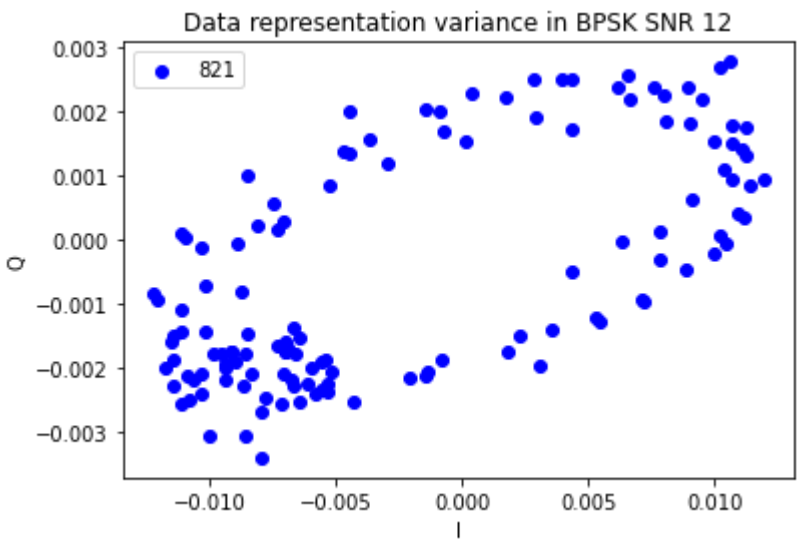

Data representation variance in BPSK SNR 12
816
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

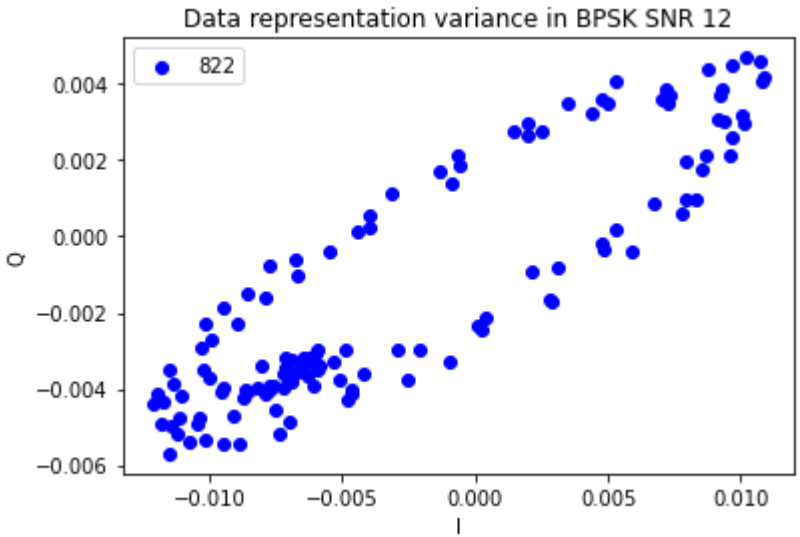

Data representation variance in BPSK SNR 12
817
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010 −0.005 0.000 0.005 0.010
I

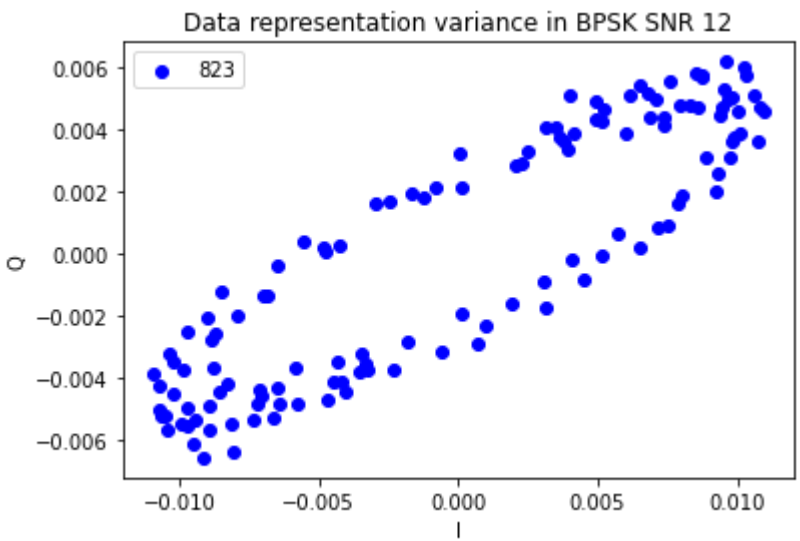

Data representation variance in BPSK SNR 12
818
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

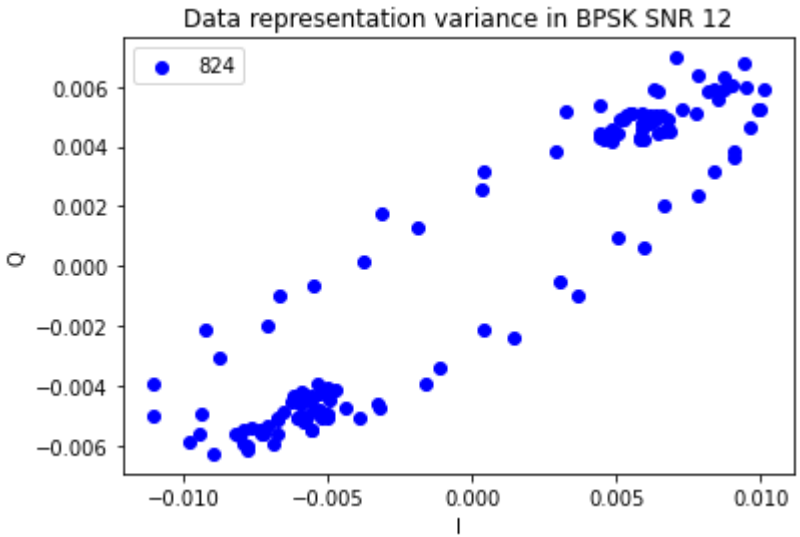

Data representation variance in BPSK SNR 12
819
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
820
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
821
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
822
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
823
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
824
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0.004
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0.000
−0.002
−0.004
−0.006
Q
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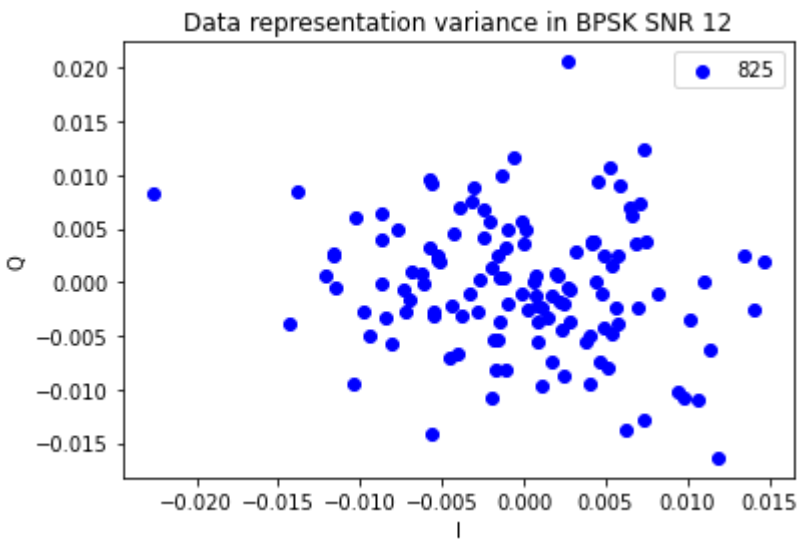
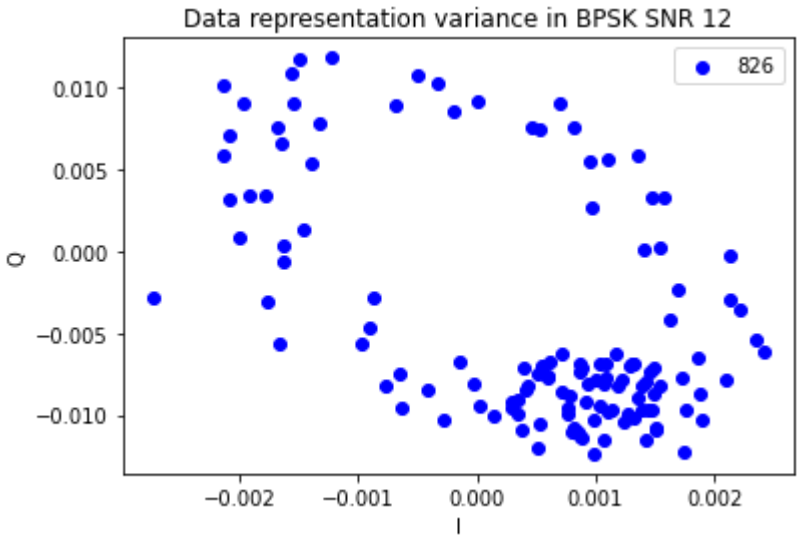
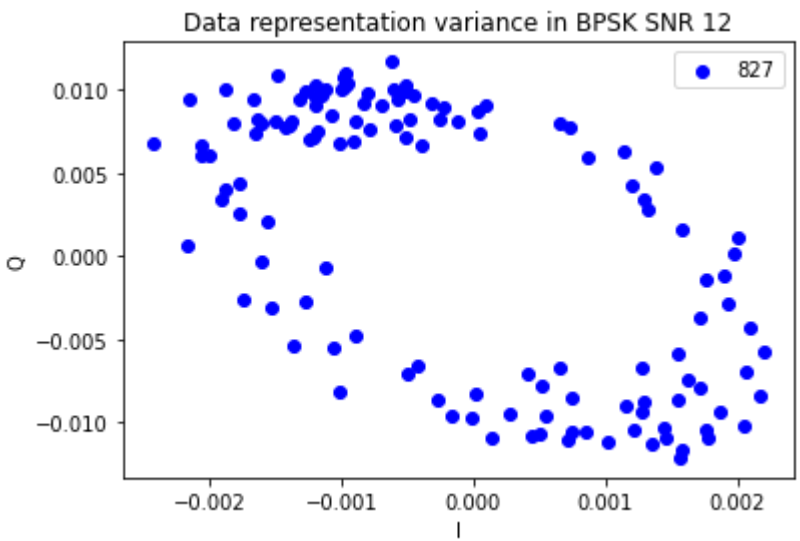
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
825
0.020
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.020
−0.015
−0.010
−0.005
0.000
0.005
0.010
0.015
I


Data representation variance in BPSK SNR 12
826
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
827
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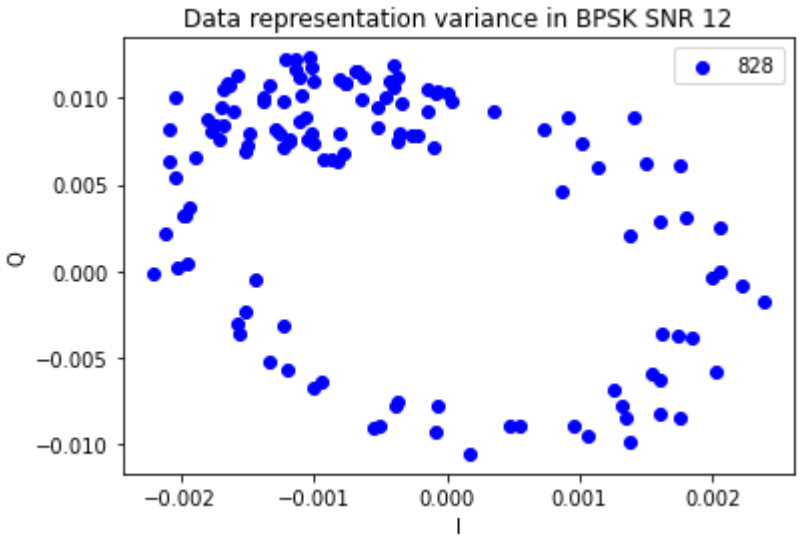
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
828
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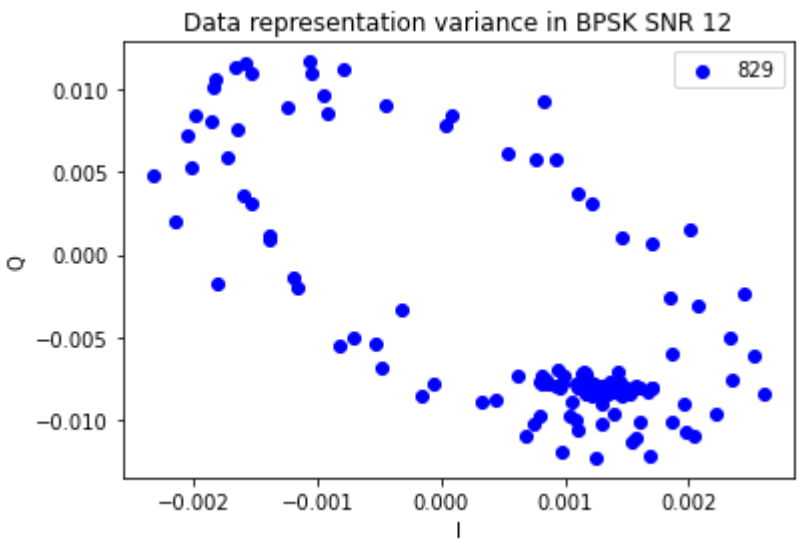
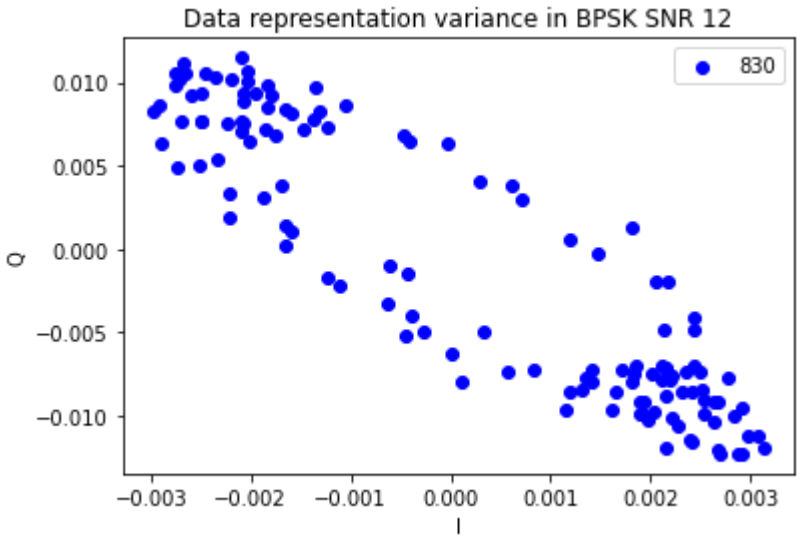
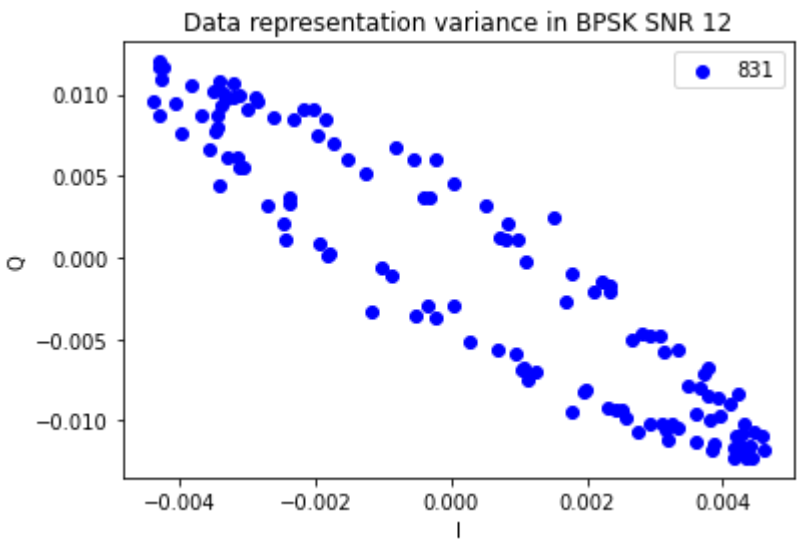
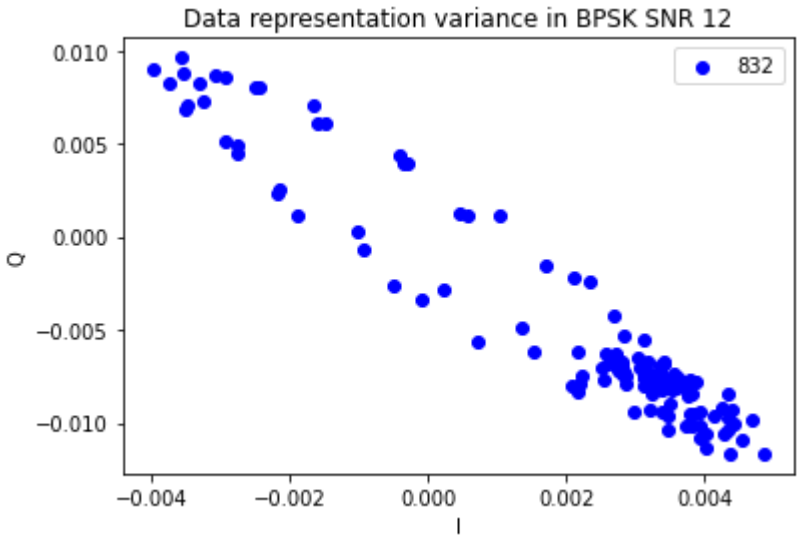
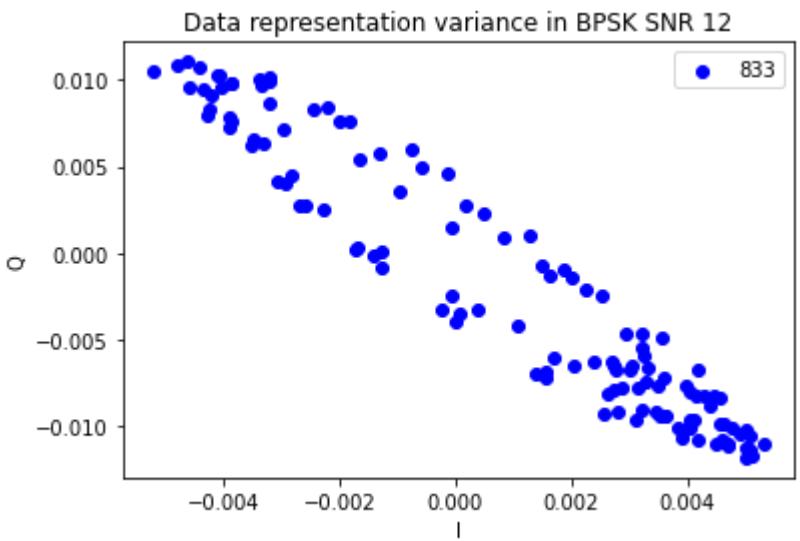
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

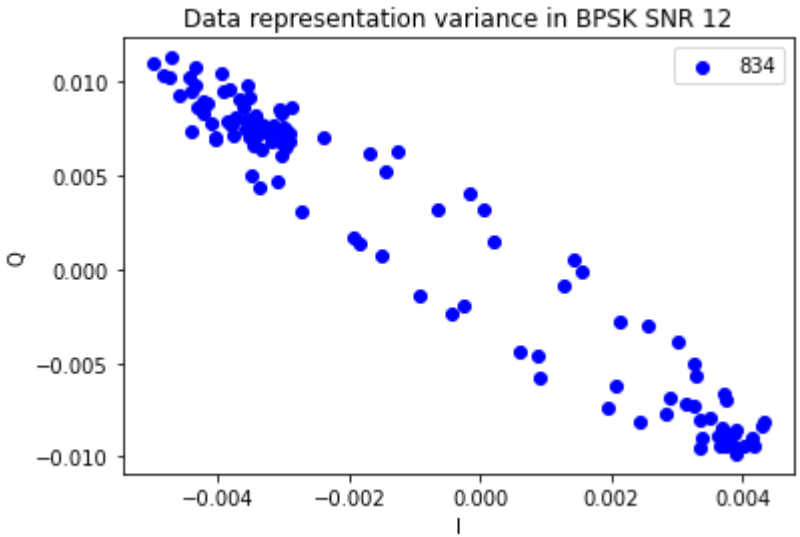

Data representation variance in BPSK SNR 12
829
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

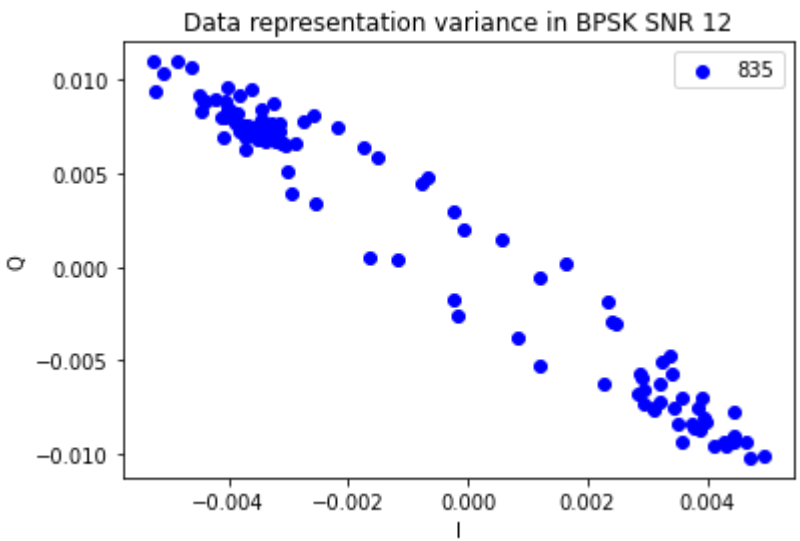

Data representation variance in BPSK SNR 12
830
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

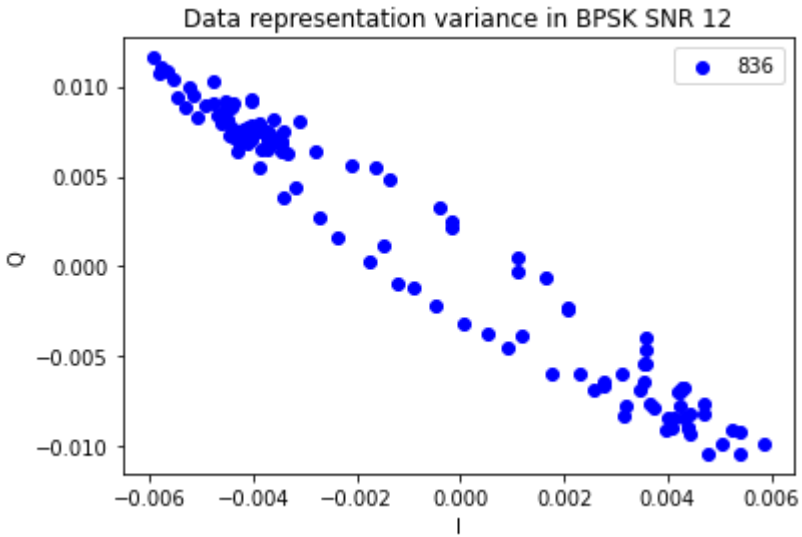

Data representation variance in BPSK SNR 12
831
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

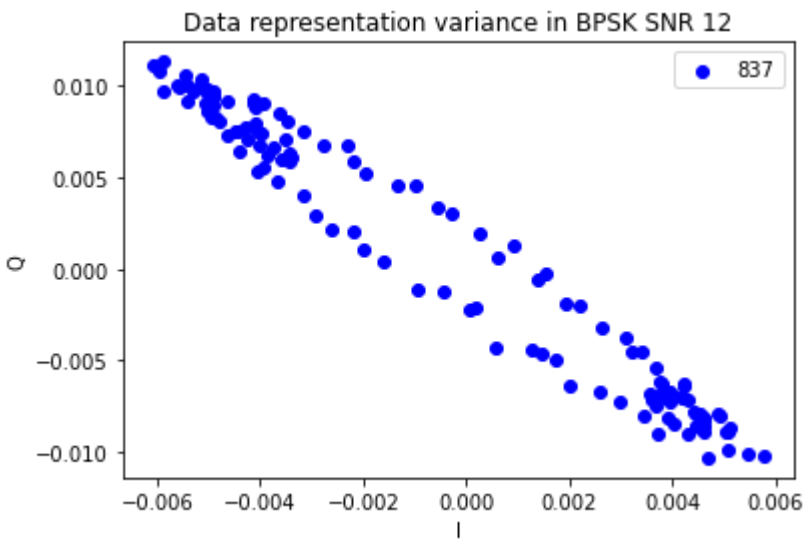

Data representation variance in BPSK SNR 12
832
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

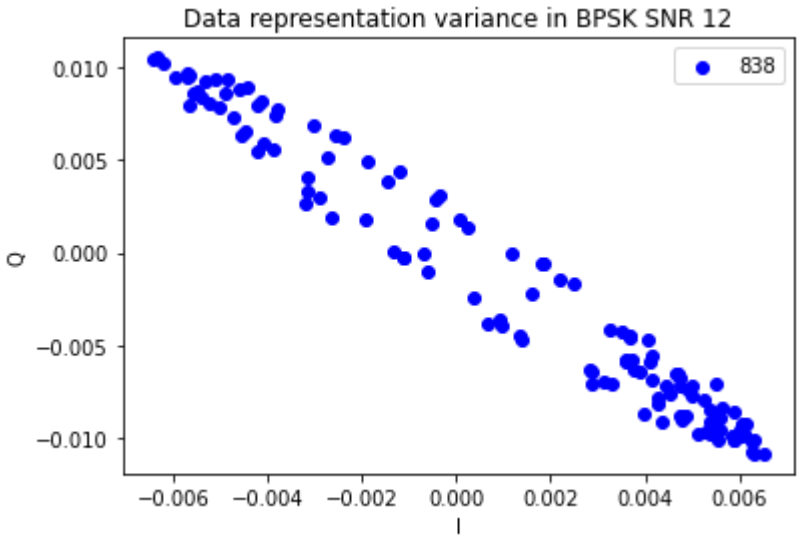

Data representation variance in BPSK SNR 12
833
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

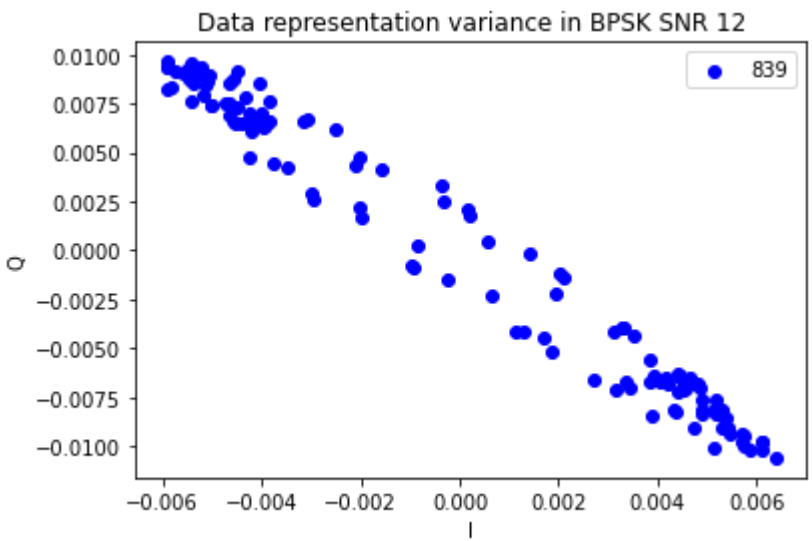

Data representation variance in BPSK SNR 12
834
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

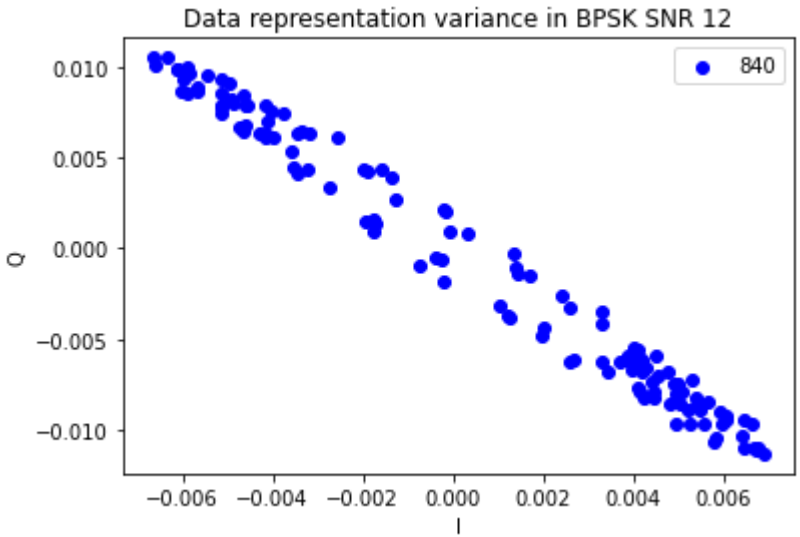

Data representation variance in BPSK SNR 12
835
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

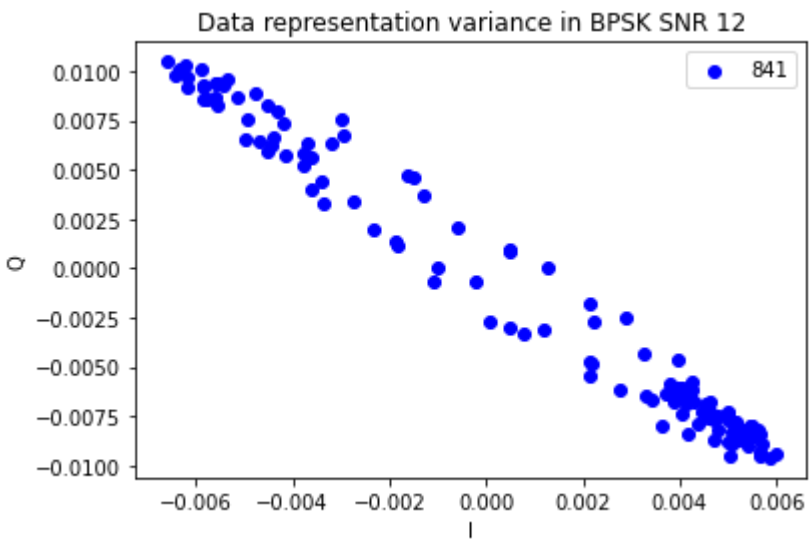

Data representation variance in BPSK SNR 12
836
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

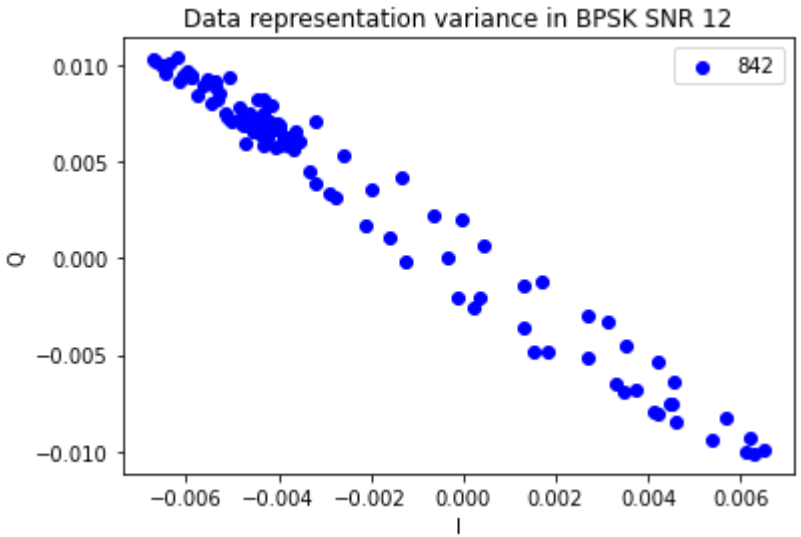

Data representation variance in BPSK SNR 12
837
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

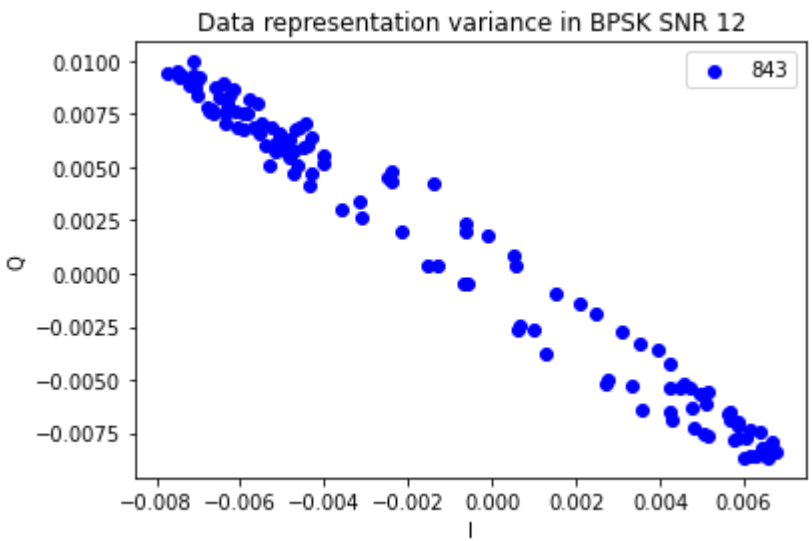

Data representation variance in BPSK SNR 12
838
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

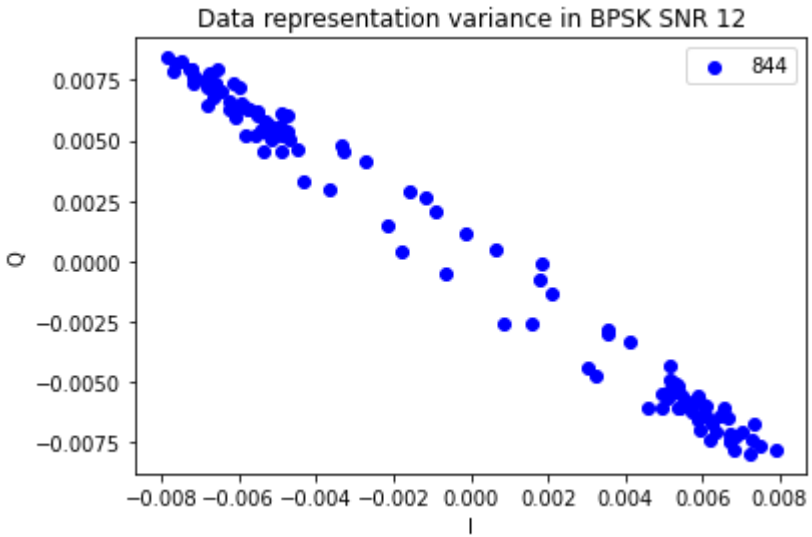

Data representation variance in BPSK SNR 12
839
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

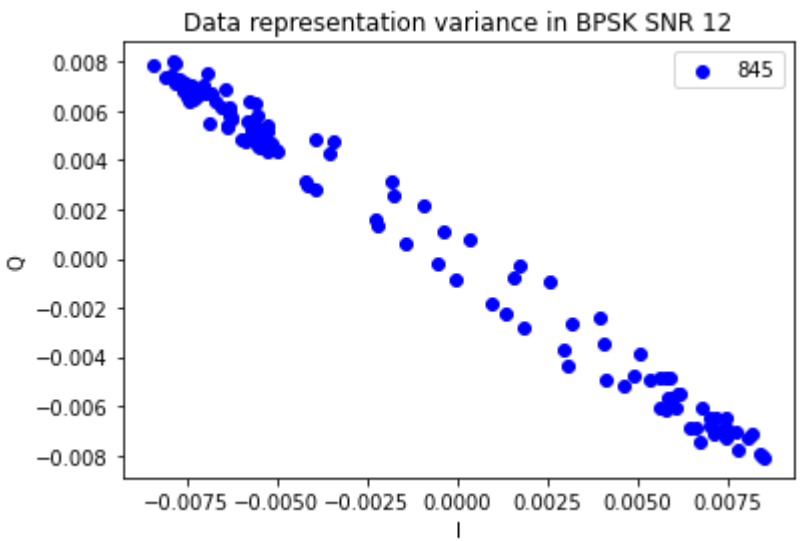

Data representation variance in BPSK SNR 12
840
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

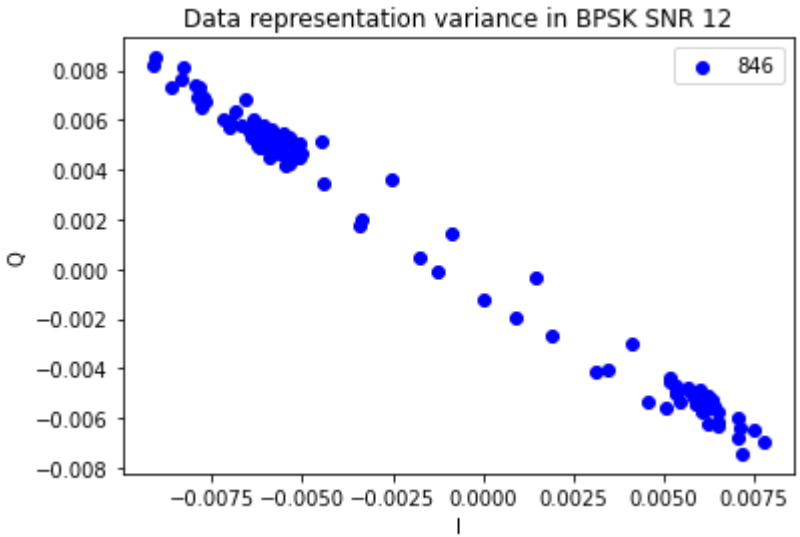

Data representation variance in BPSK SNR 12
841
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

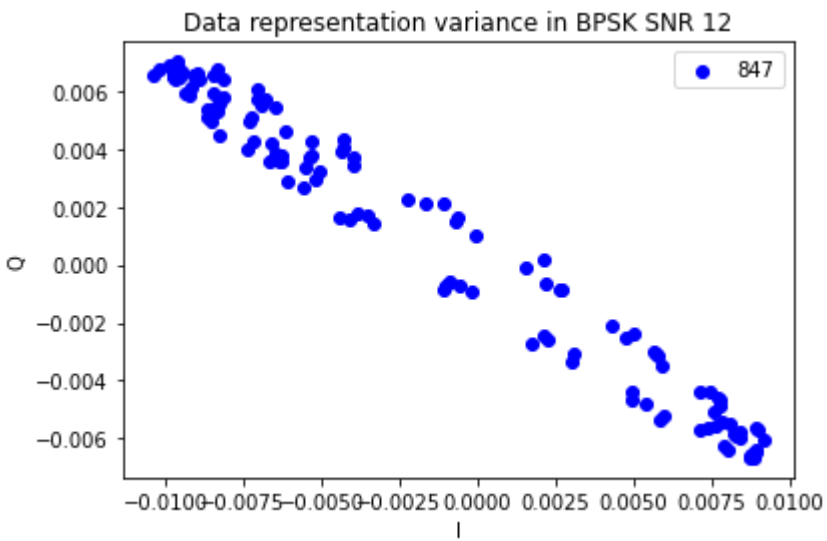

Data representation variance in BPSK SNR 12
842
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
843
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
844
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
845
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
846
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
847
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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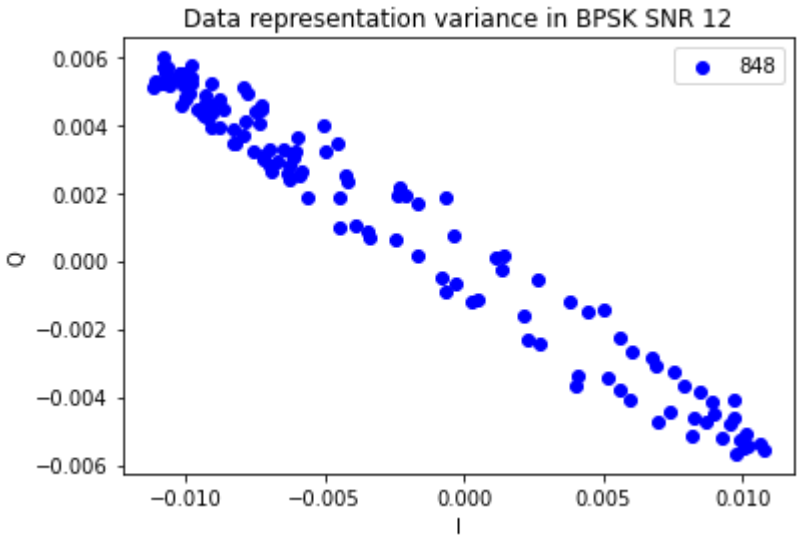
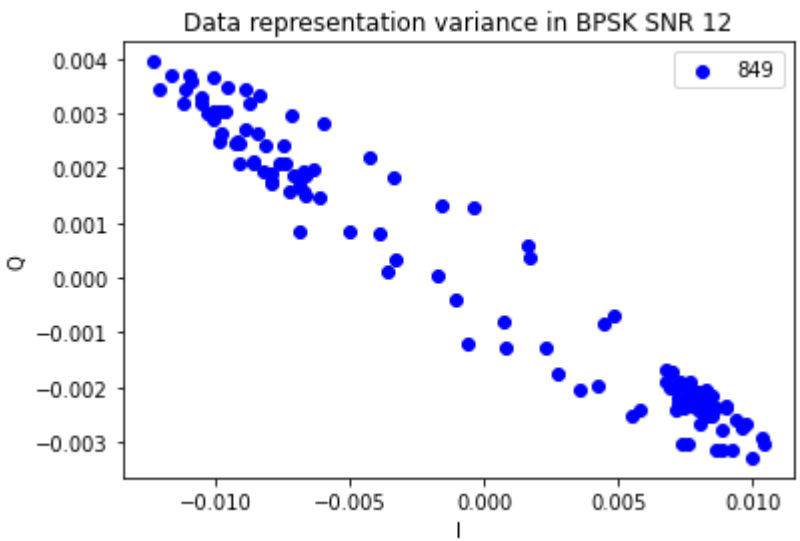
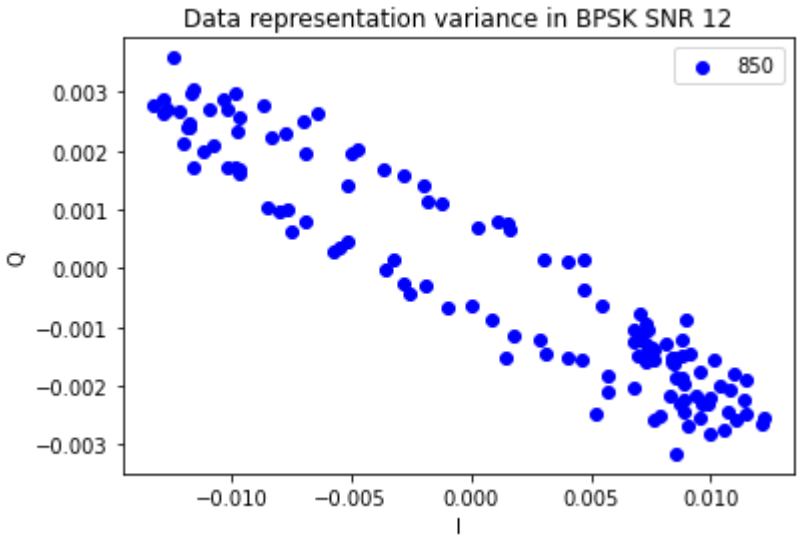
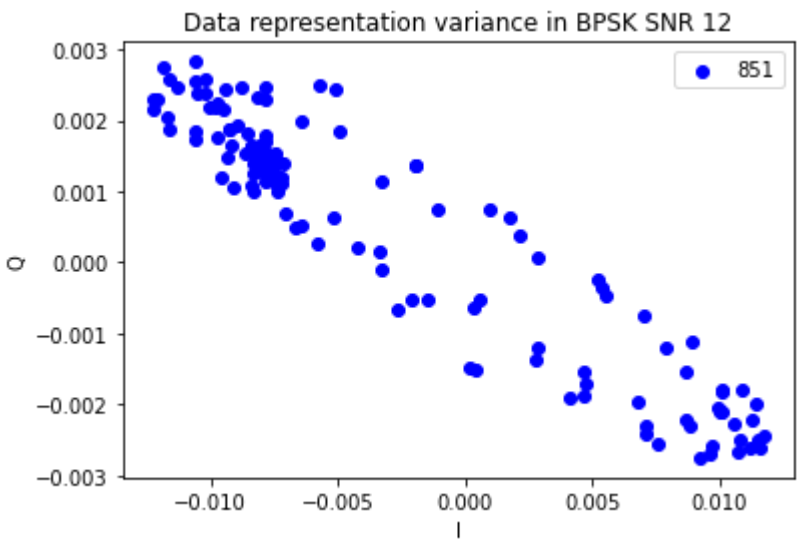
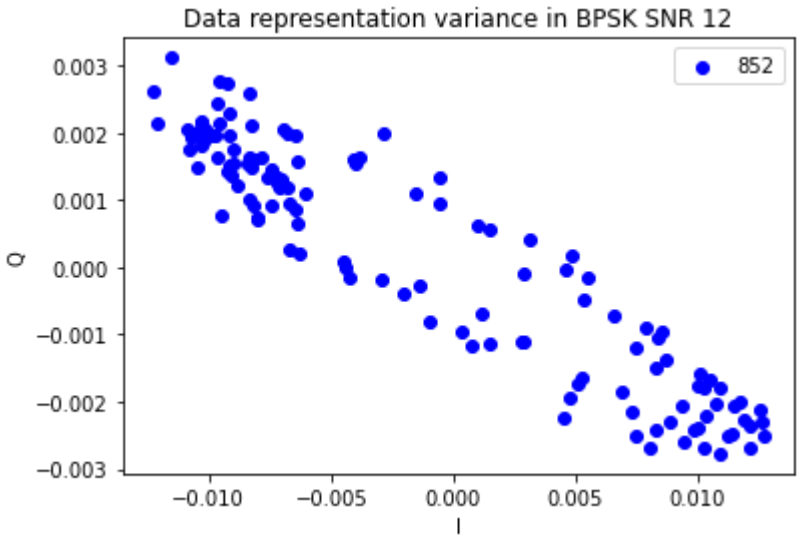
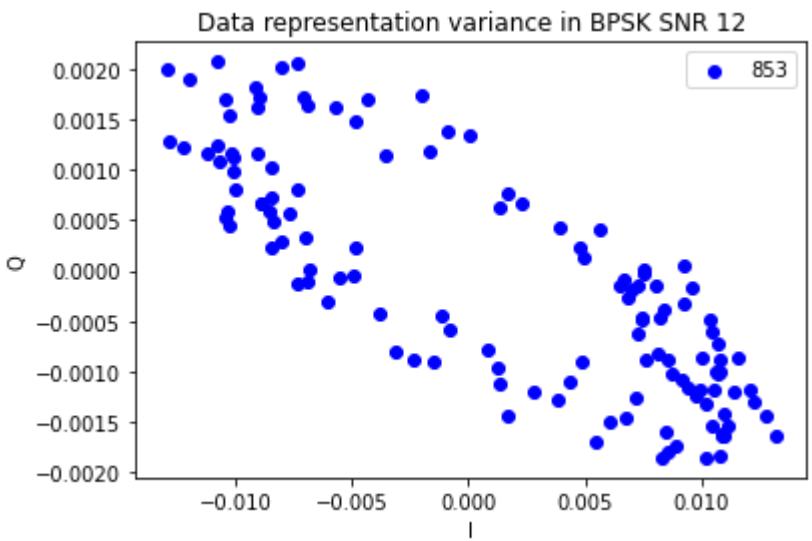

Data representation variance in BPSK SNR 12
848
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

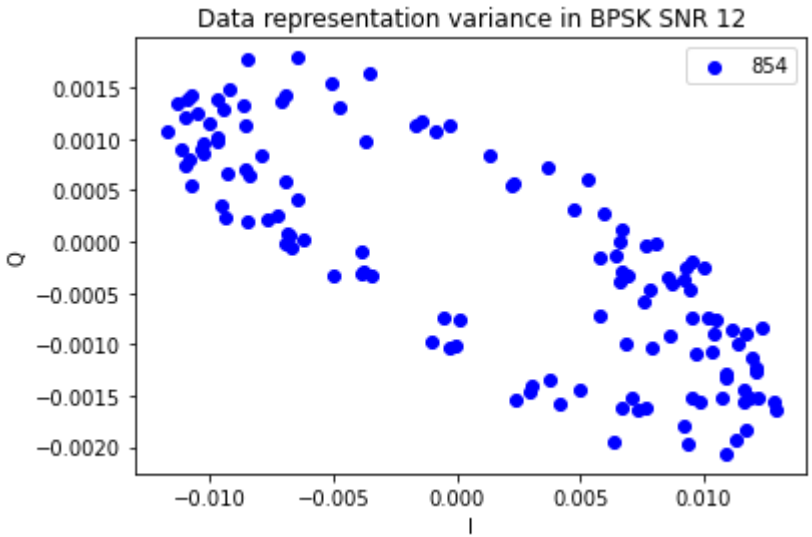

Data representation variance in BPSK SNR 12
849
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

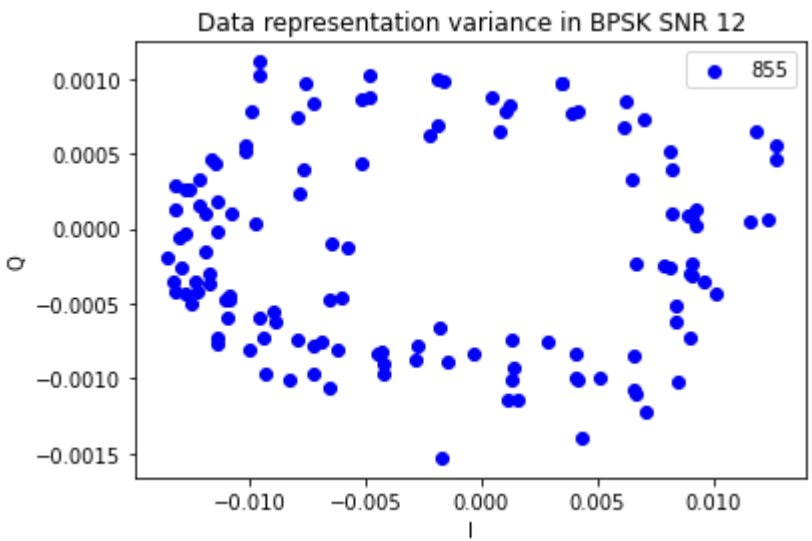

Data representation variance in BPSK SNR 12
850
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

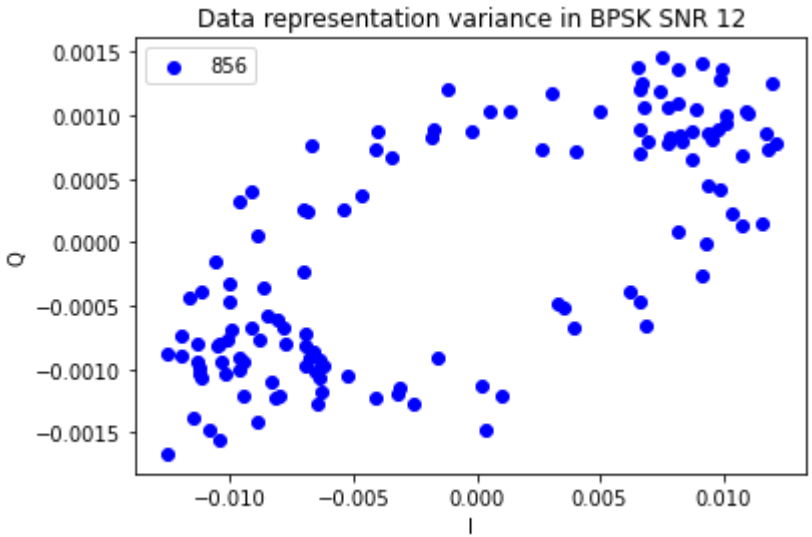

Data representation variance in BPSK SNR 12
851
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

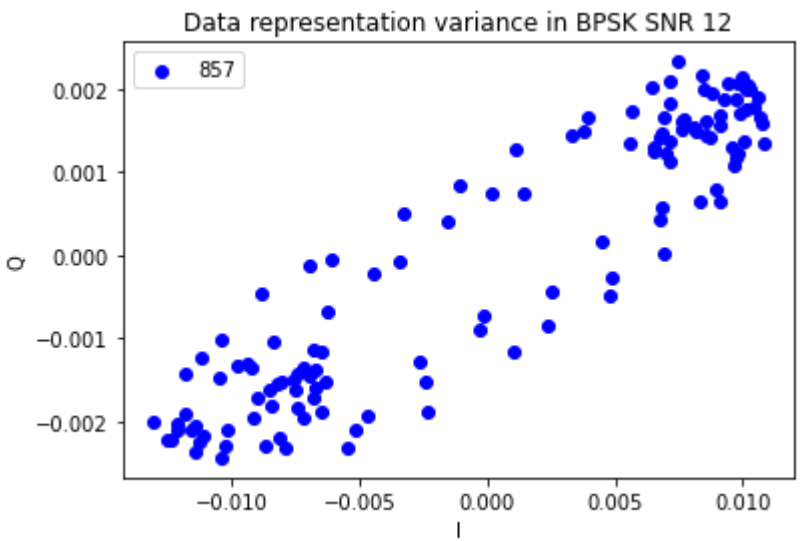

Data representation variance in BPSK SNR 12
852
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

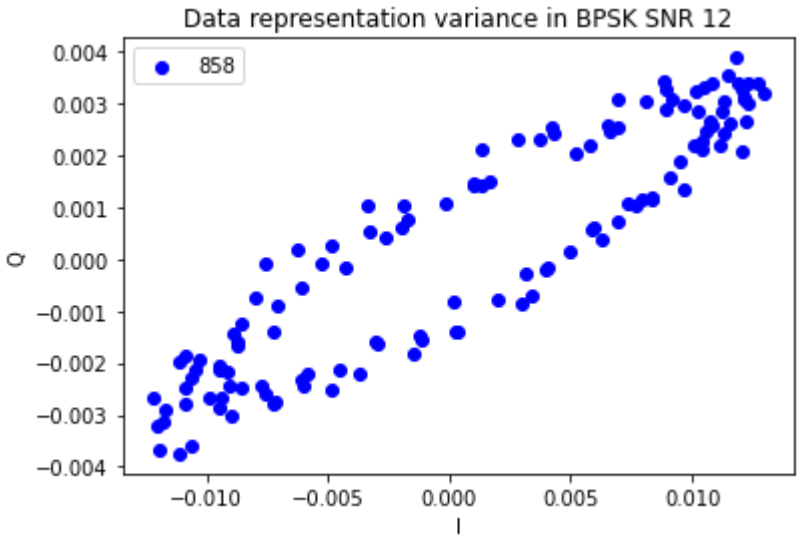

Data representation variance in BPSK SNR 12
853
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I

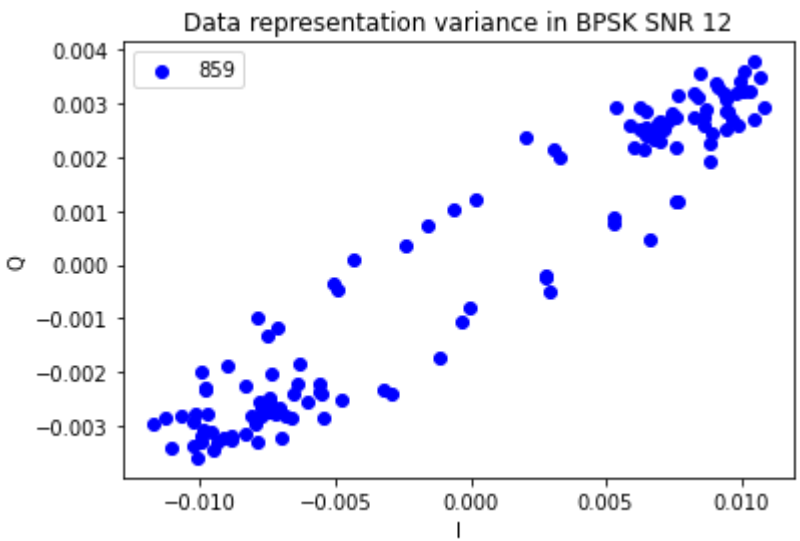

Data representation variance in BPSK SNR 12
854
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I

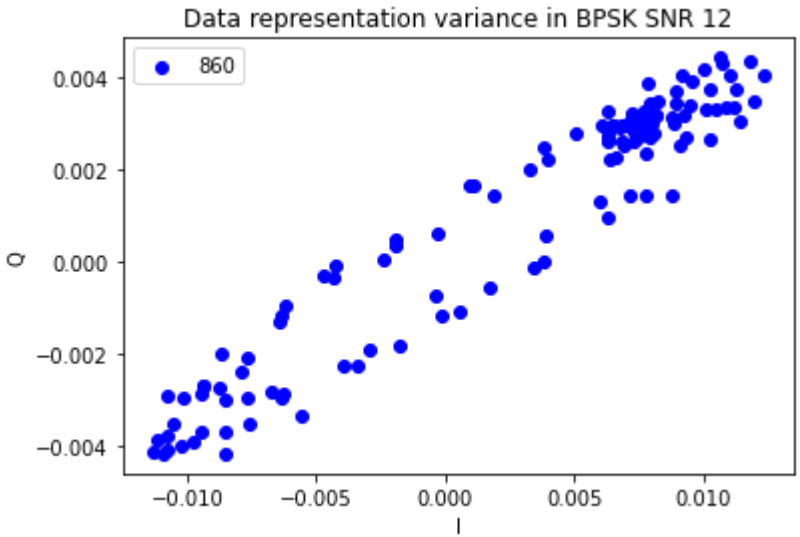

Data representation variance in BPSK SNR 12
855
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

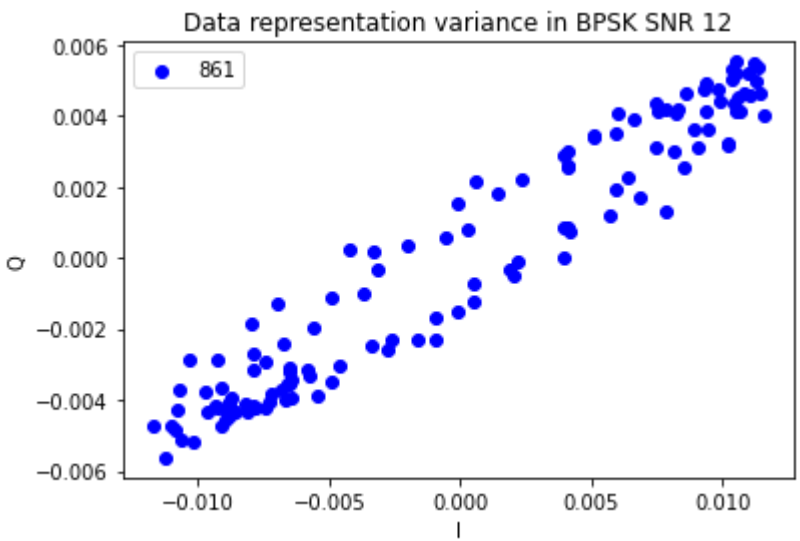

Data representation variance in BPSK SNR 12
856
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

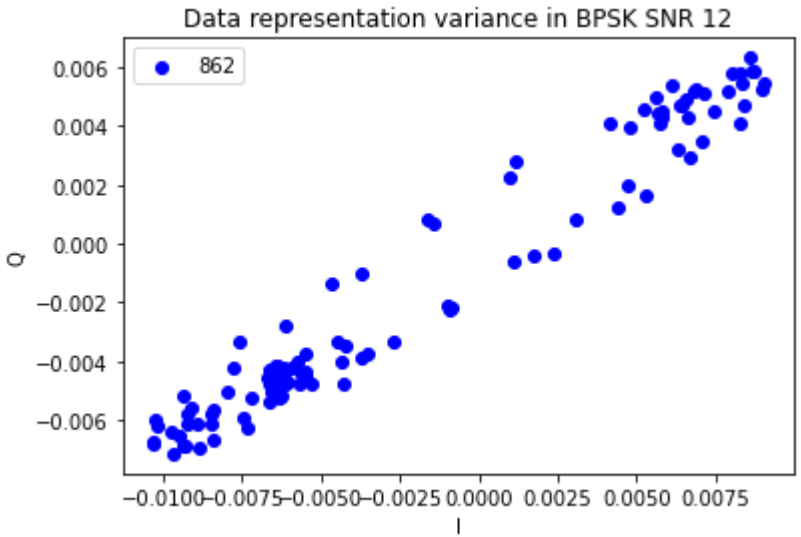

Data representation variance in BPSK SNR 12
857
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

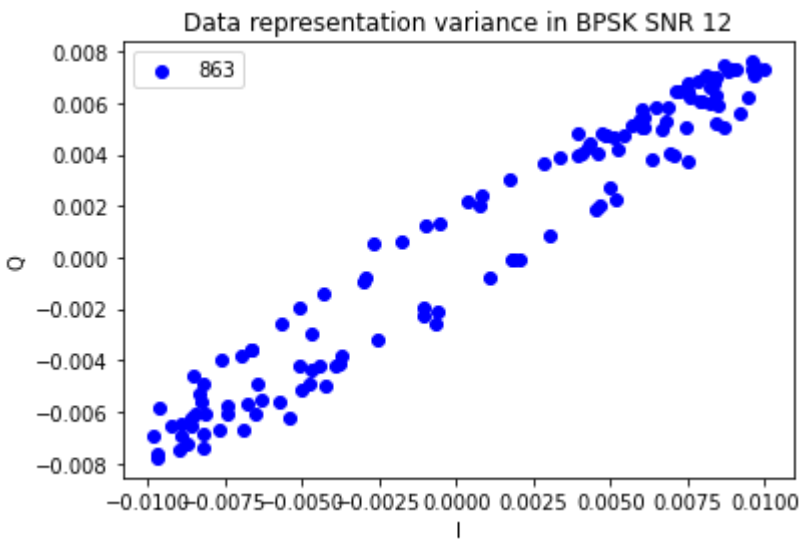

Data representation variance in BPSK SNR 12
858
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

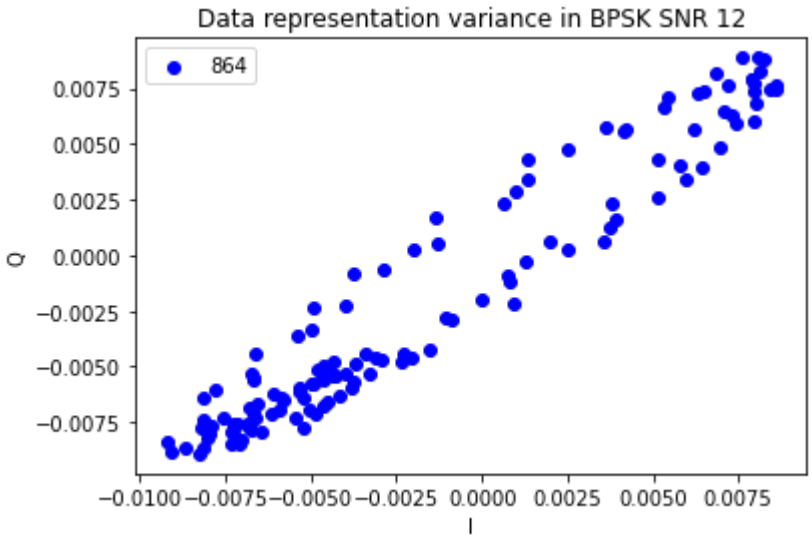

Data representation variance in BPSK SNR 12
859
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

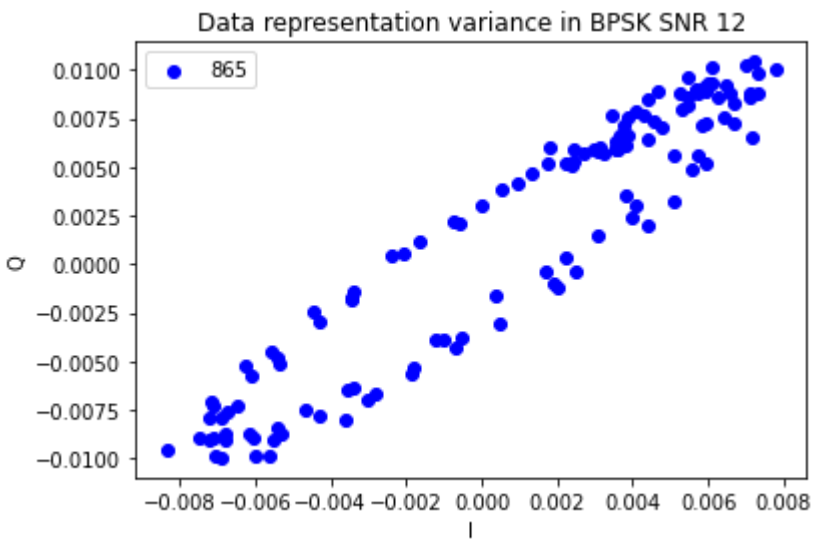

Data representation variance in BPSK SNR 12
860
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

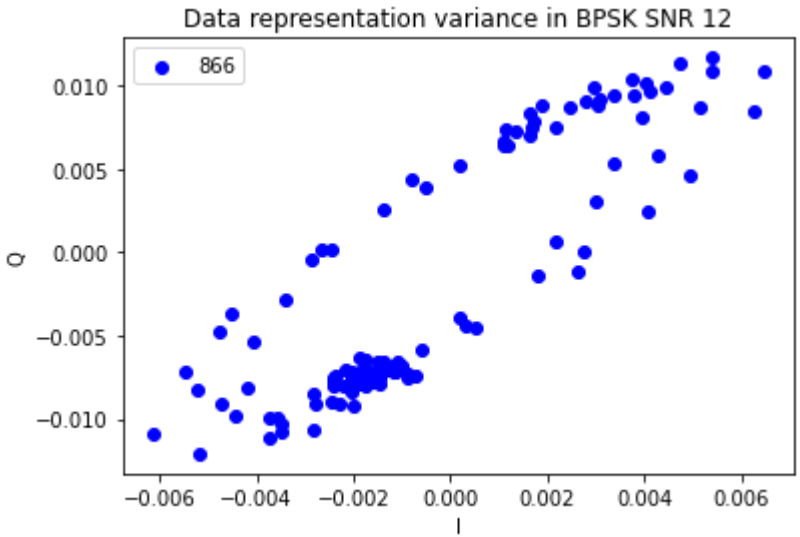

Data representation variance in BPSK SNR 12
861
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

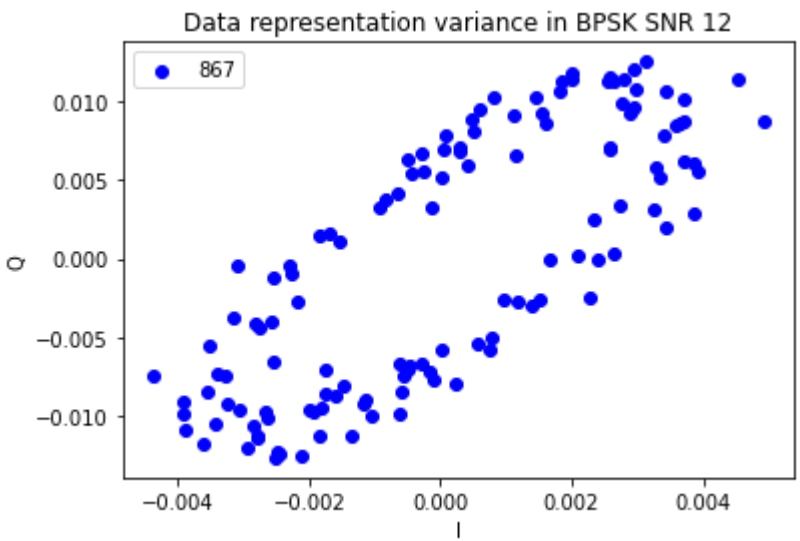

Data representation variance in BPSK SNR 12
862
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
863
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
864
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
865
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
866
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
867
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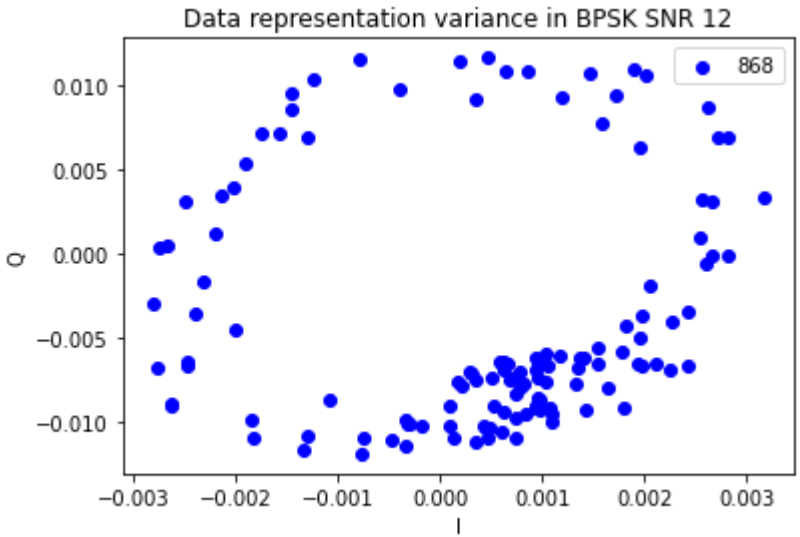
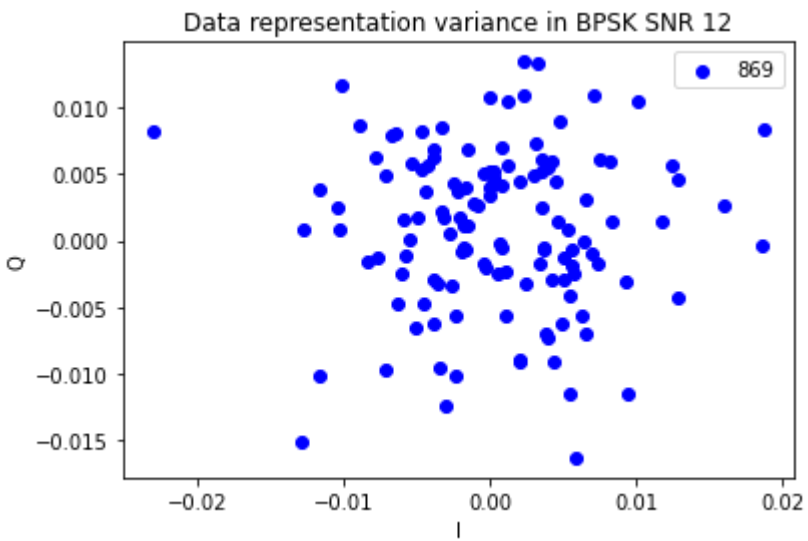
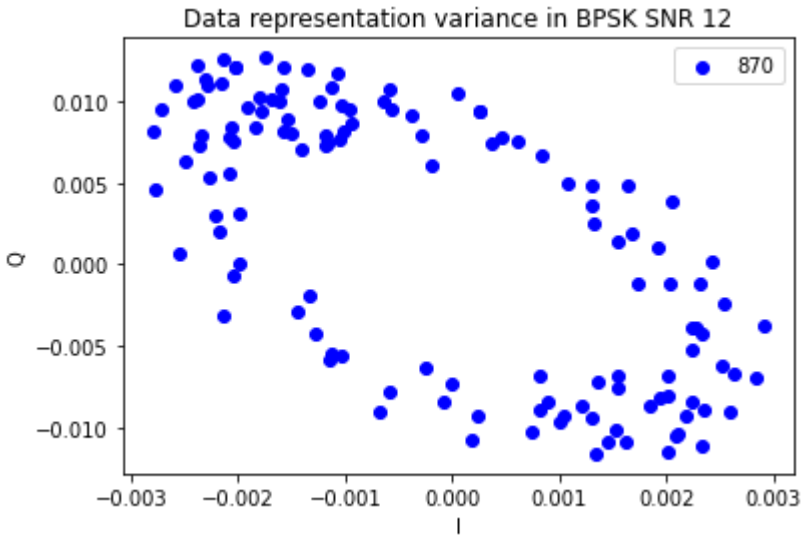
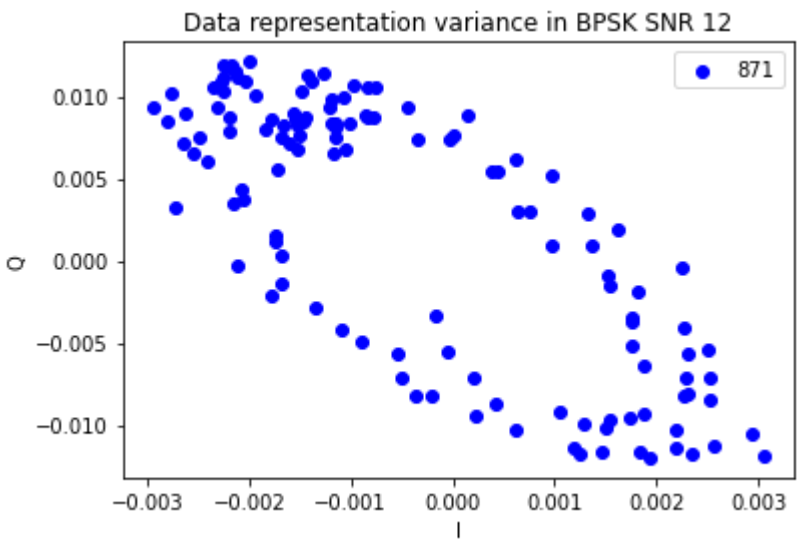
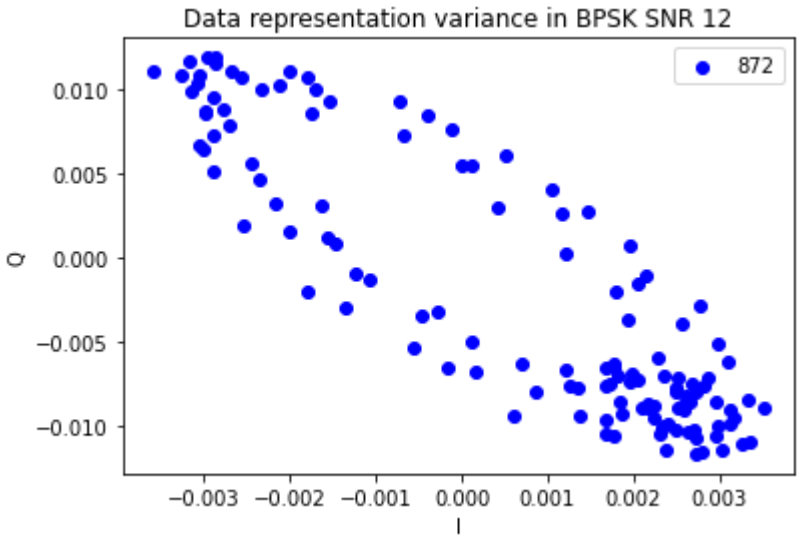
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

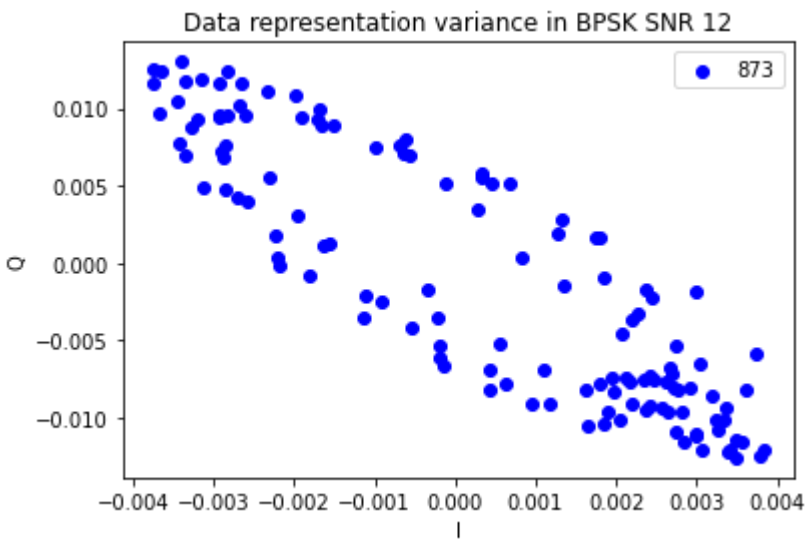

Data representation variance in BPSK SNR 12
868
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

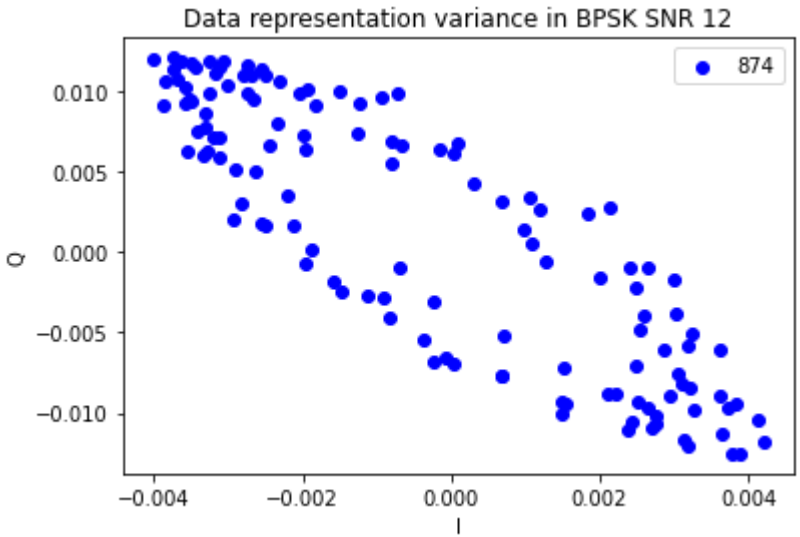

Data representation variance in BPSK SNR 12
869
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.02
−0.01
0.00
0.01
0.02
I

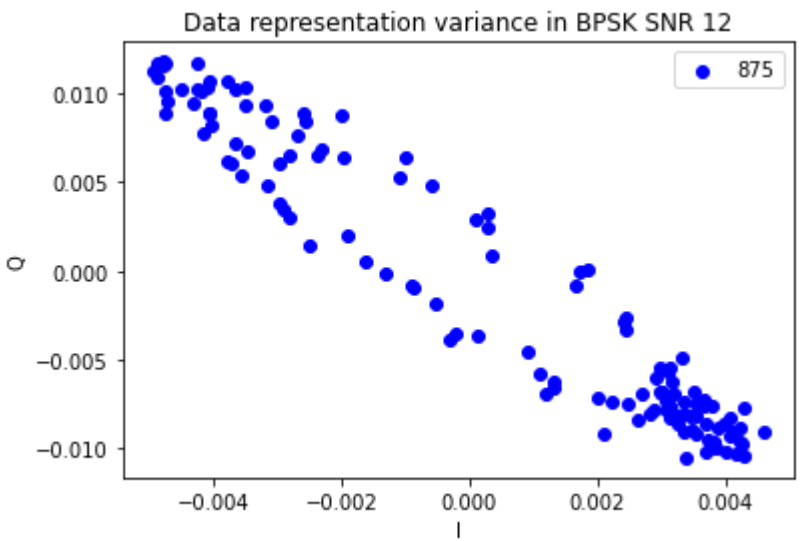

Data representation variance in BPSK SNR 12
870
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

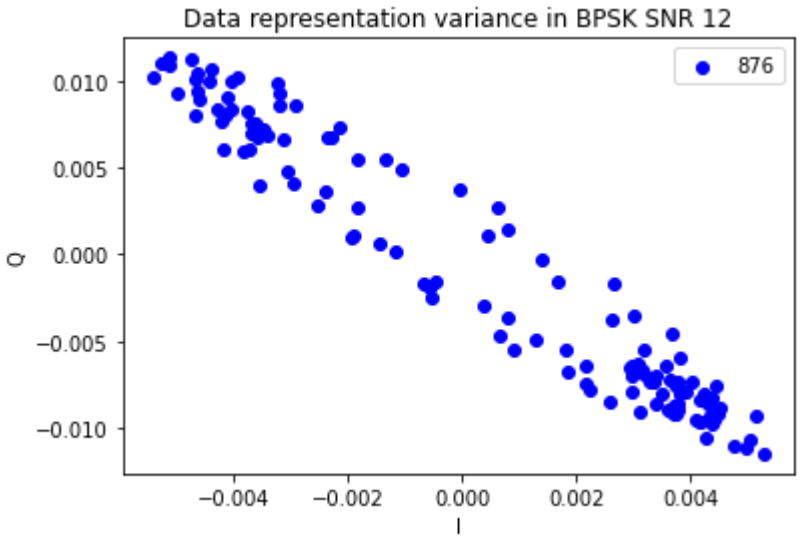

Data representation variance in BPSK SNR 12
871
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

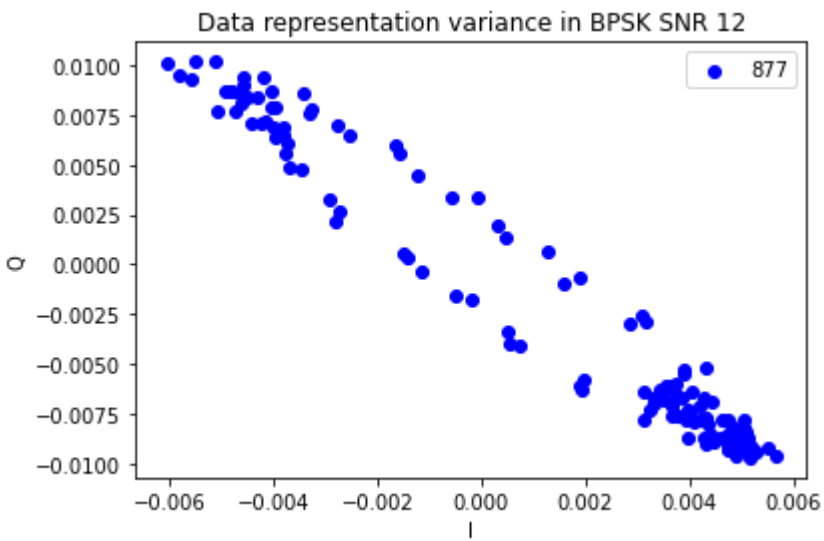

Data representation variance in BPSK SNR 12
872
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

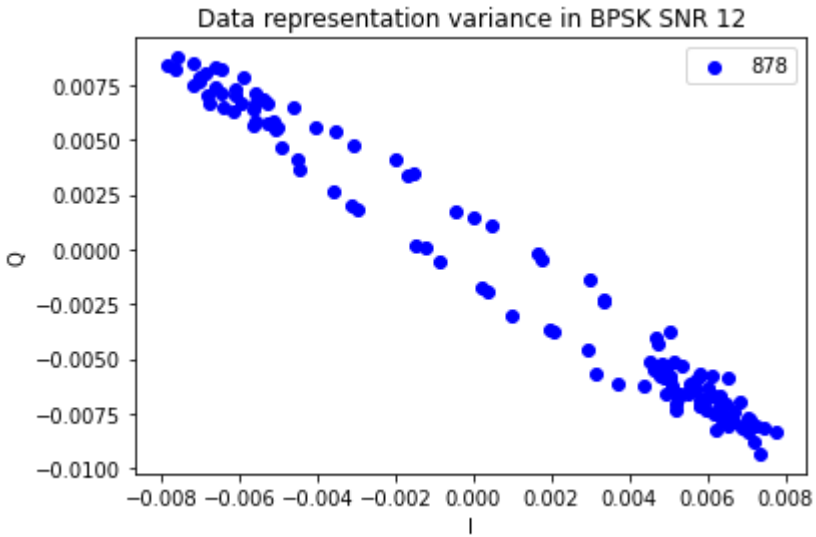

Data representation variance in BPSK SNR 12
873
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I

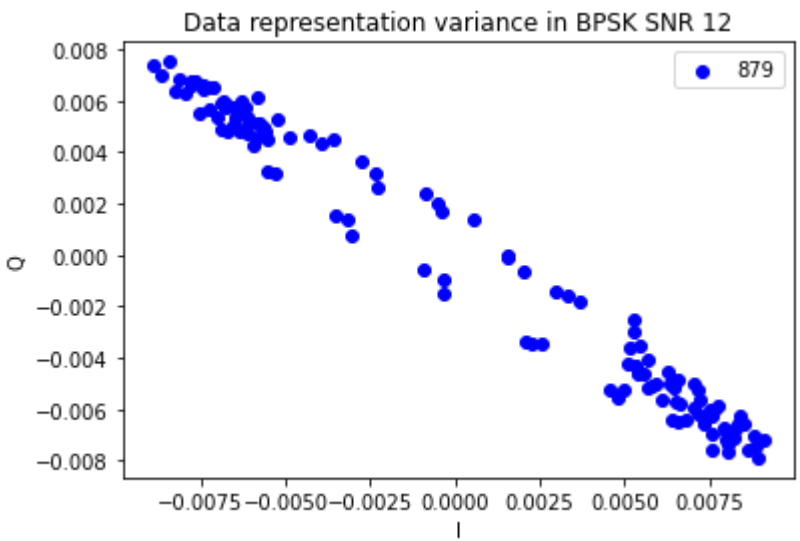

Data representation variance in BPSK SNR 12
874
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
875
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
876
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
877
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
878
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I


Data representation variance in BPSK SNR 12
879
0.008
0.006
0.004
0.002
0.000
−0.002
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−0.006
−0.008
Q
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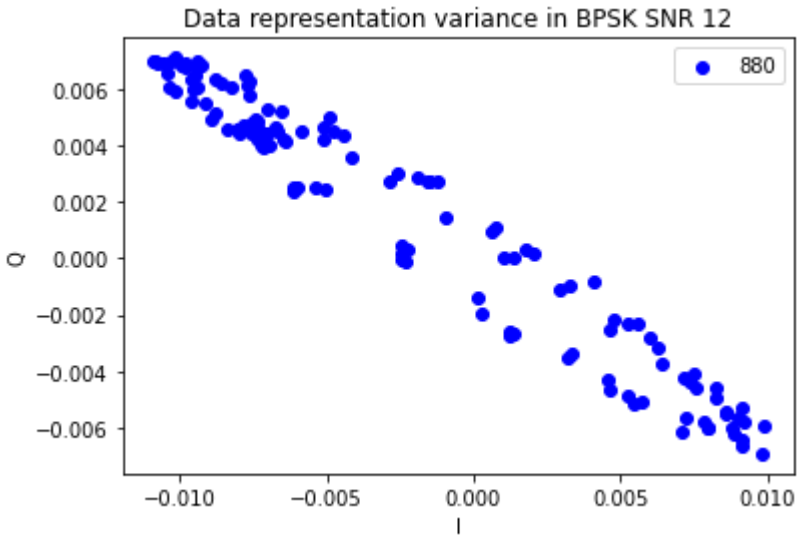
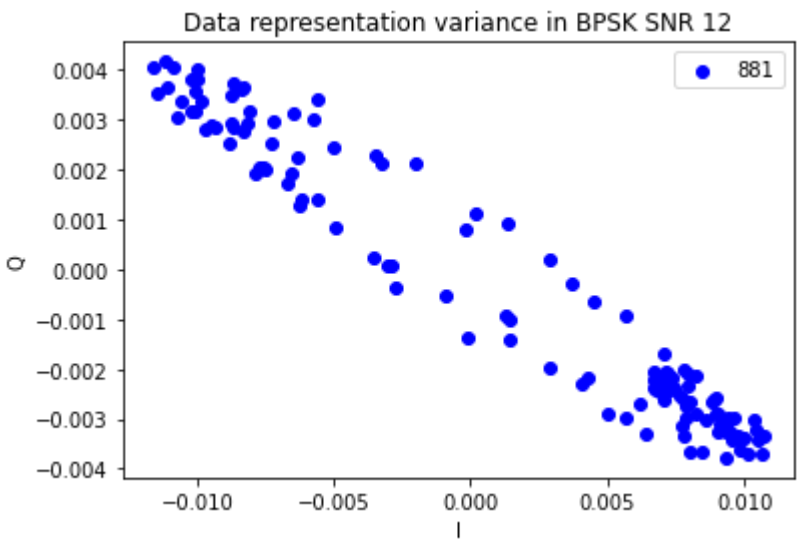

Data representation variance in BPSK SNR 12
880
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
881
0.004
0.003
0.002
0.001
0.000
−0.001
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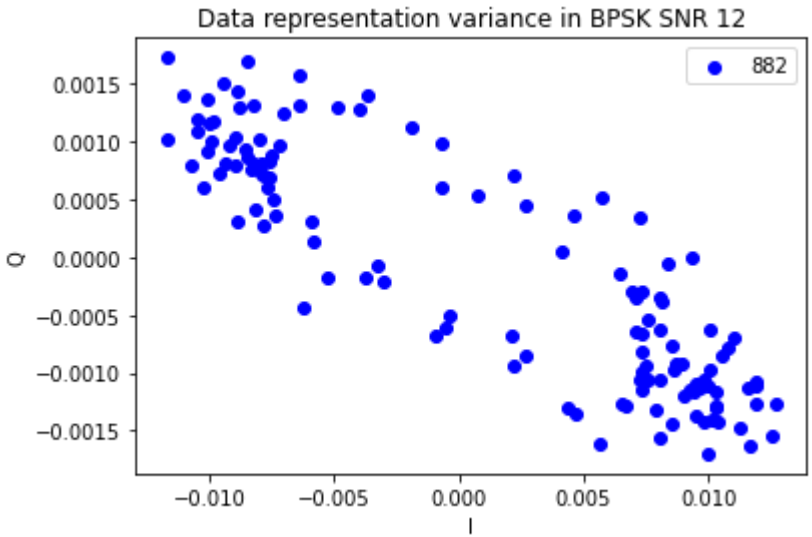
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
882
0.0015
0.0010
0.0005
0.0000
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−0.0010
−0.0015
Q
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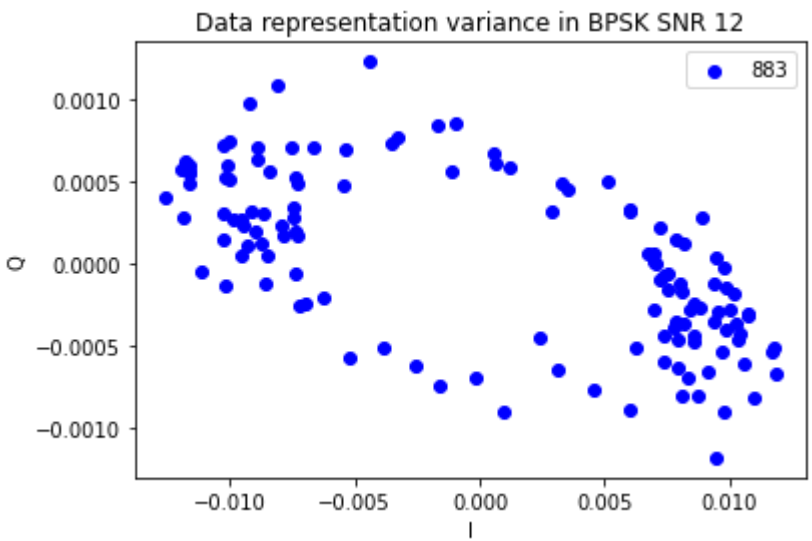
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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0.0005
0.0000
−0.0005
−0.0010
Q
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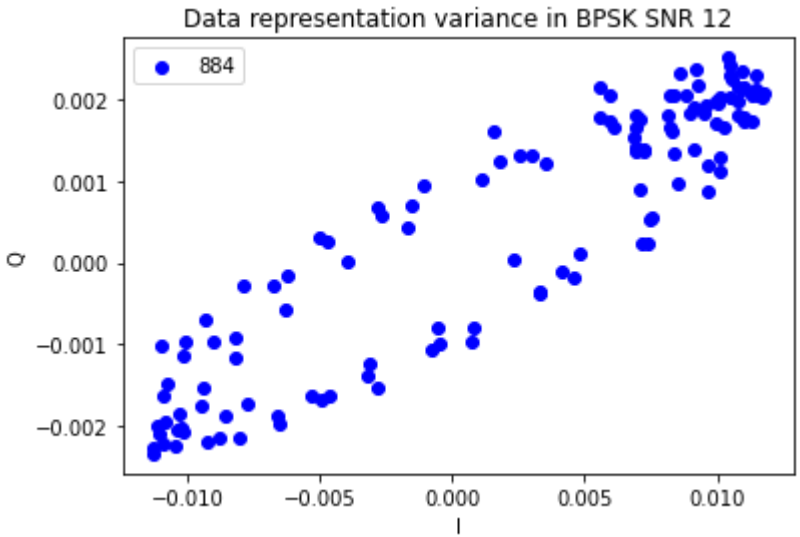
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
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0.001
0.000
−0.001
−0.002
Q
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−0.005
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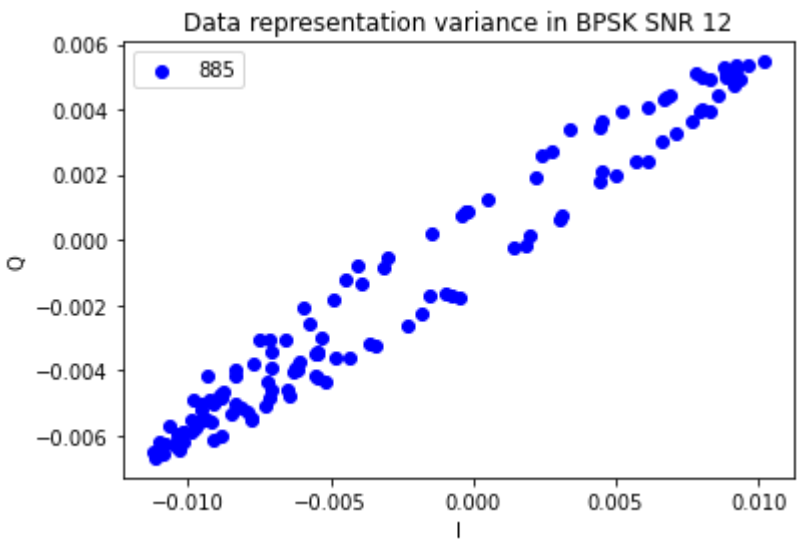
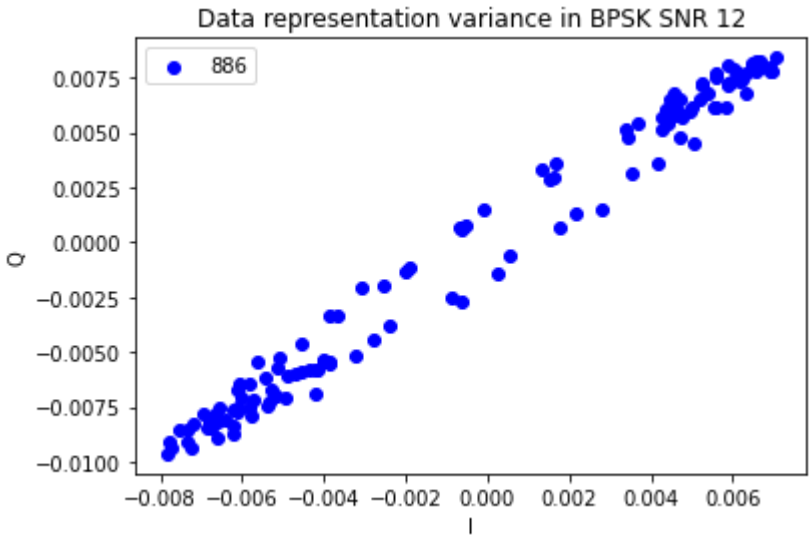
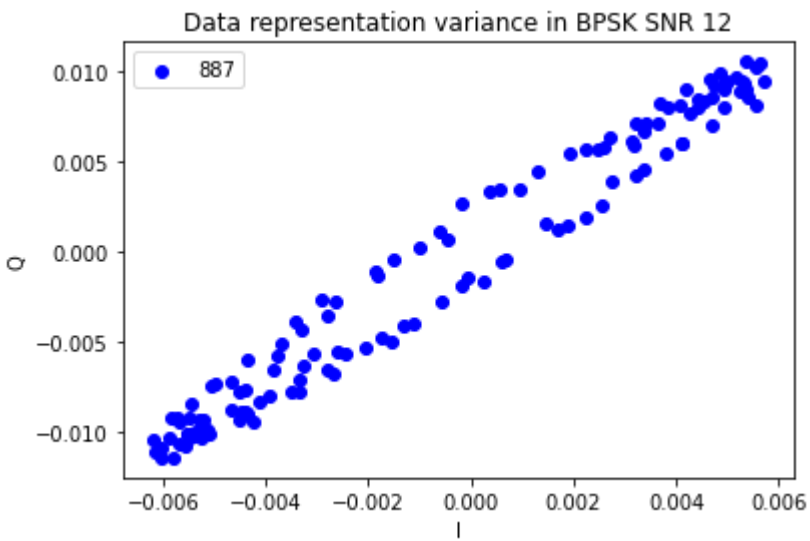
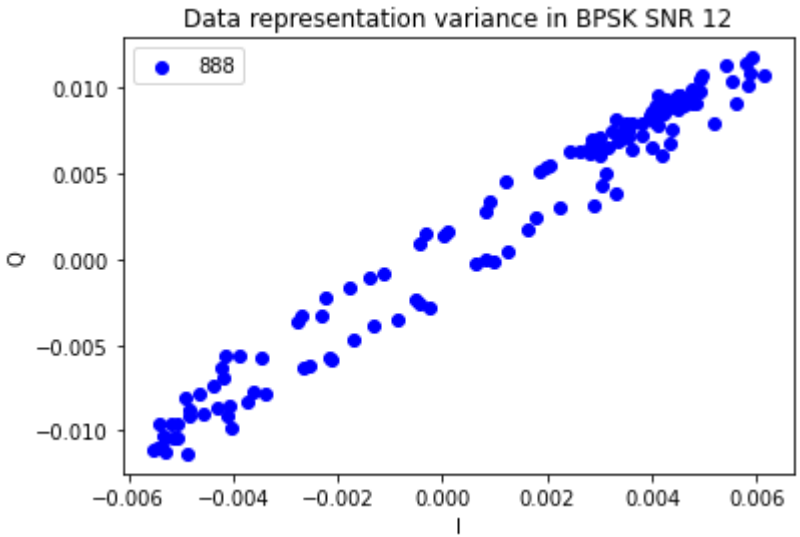
0.010
I


Data representation variance in BPSK SNR 12
885
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I


Data representation variance in BPSK SNR 12
886
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
887
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I


Data representation variance in BPSK SNR 12
888
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
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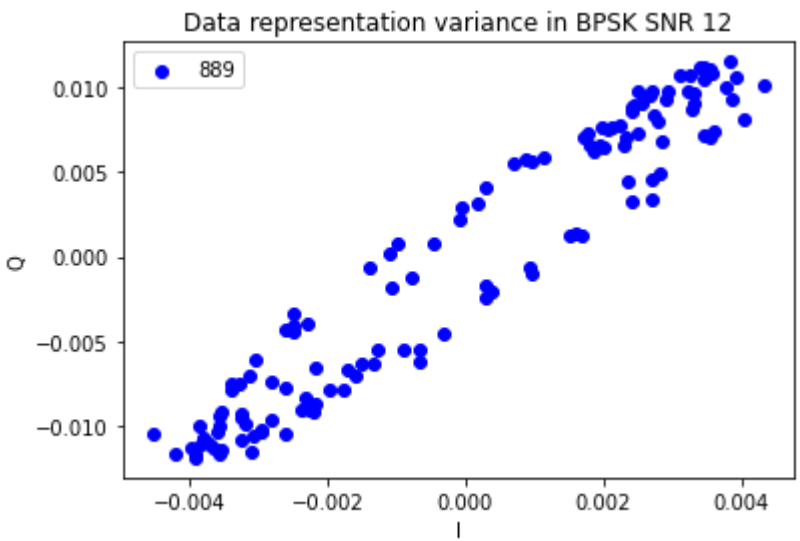
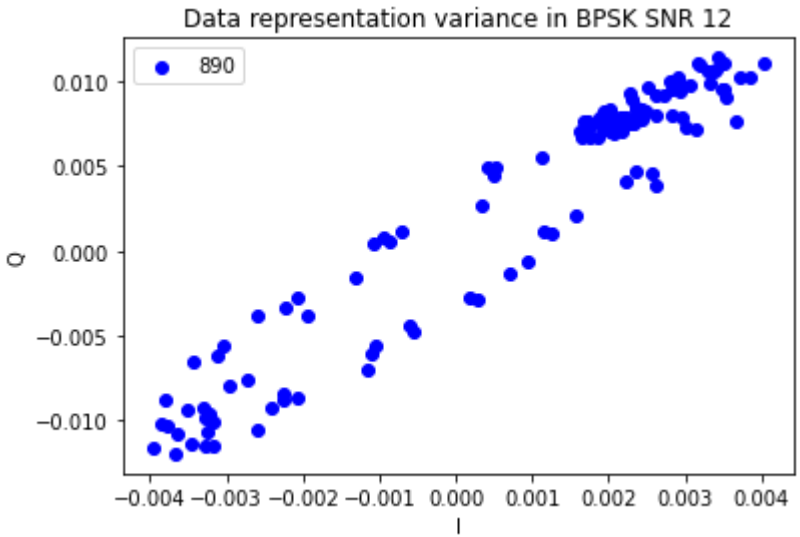
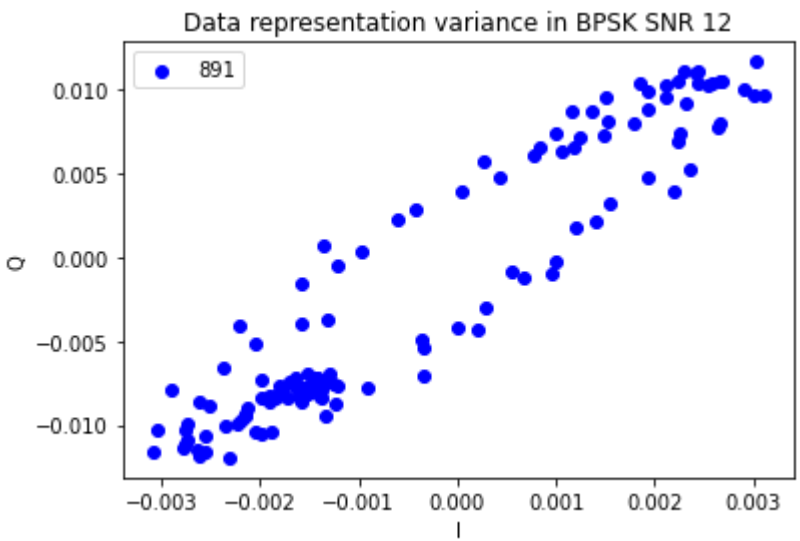
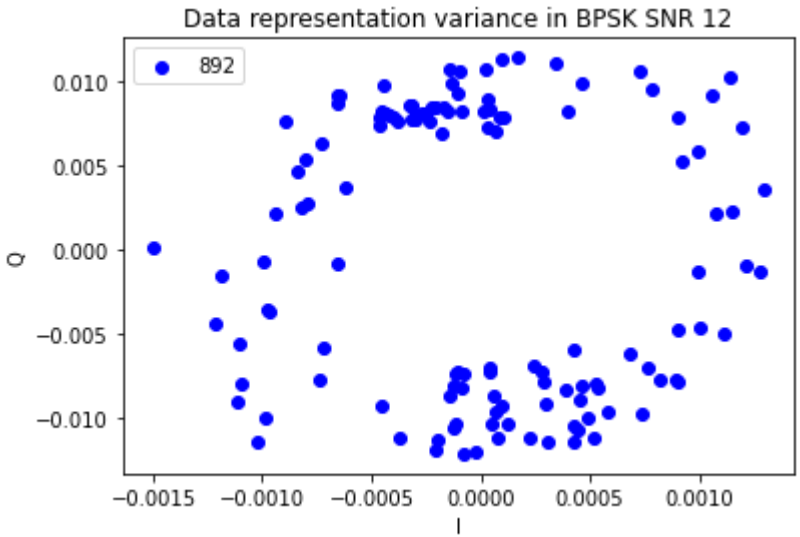
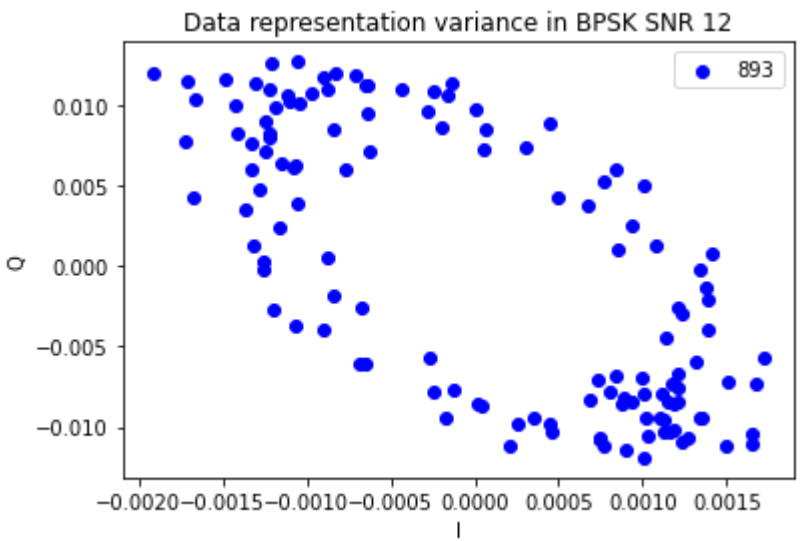
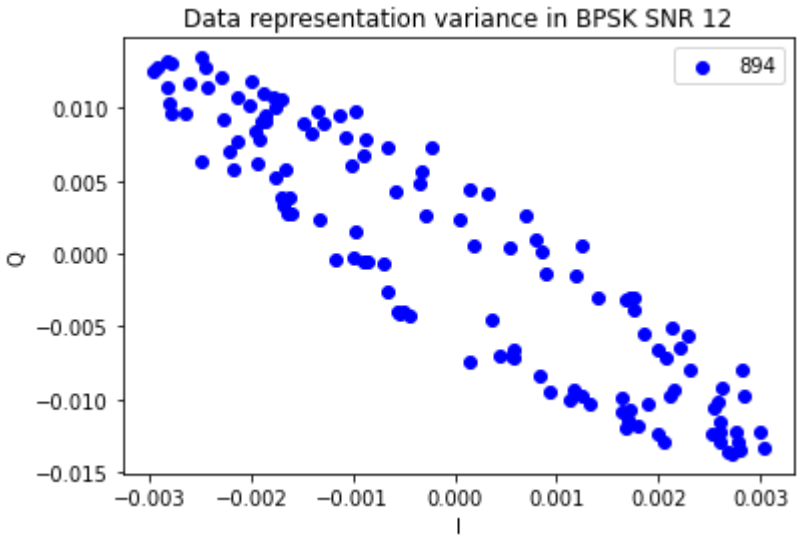

Data representation variance in BPSK SNR 12
889
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
890
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
891
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I


Data representation variance in BPSK SNR 12
892
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
I


Data representation variance in BPSK SNR 12
893
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I


Data representation variance in BPSK SNR 12
894
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
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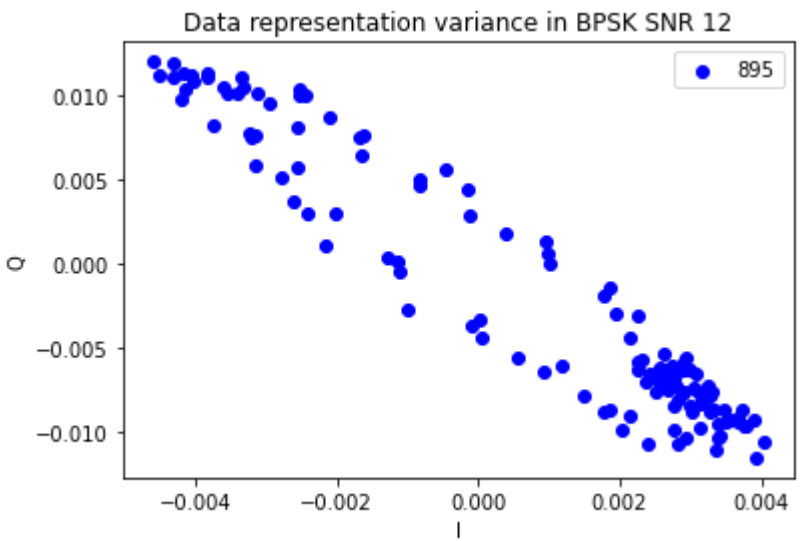
Data representation variance in BPSK SNR 12
895
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0.000
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−0.010
Q
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−0.002
0.000
0.002
0.004
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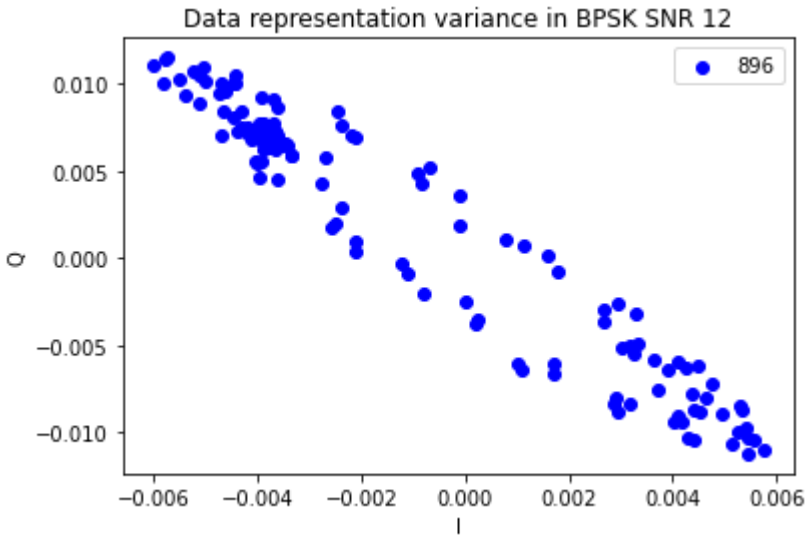
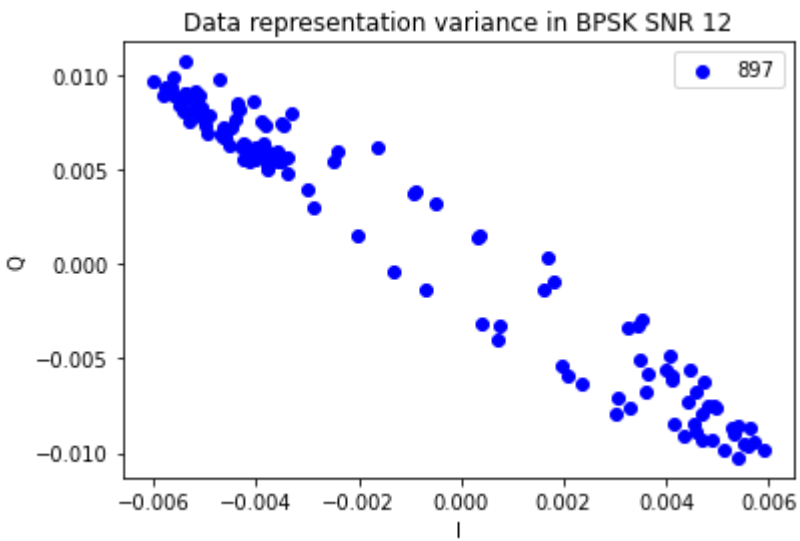
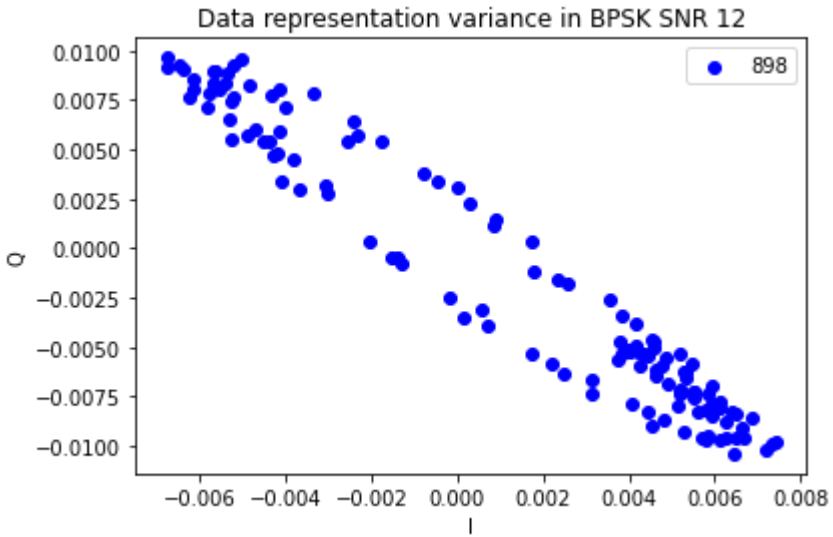

Data representation variance in BPSK SNR 12
896
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
897
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
898
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
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0.002
0.004
0.006
0.008
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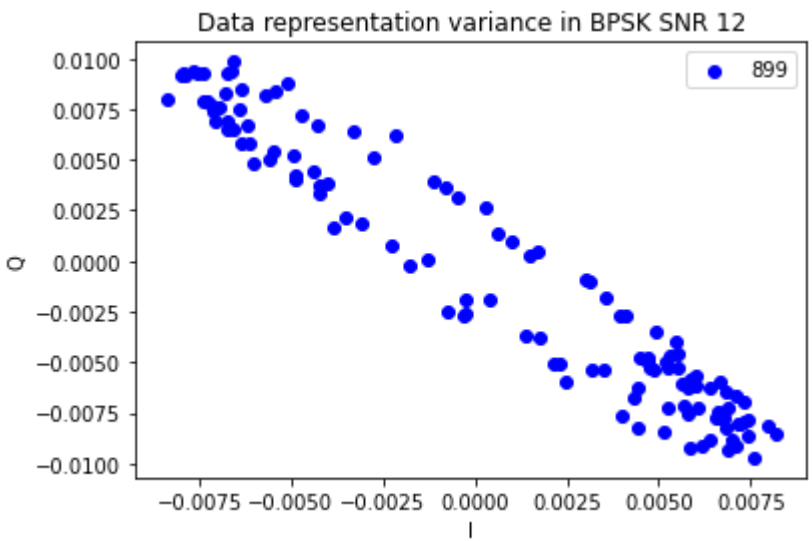
Data representation variance in BPSK SNR 12
899
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0.0075
0.0050
0.0025
0.0000
−0.0025
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Q
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0.0050
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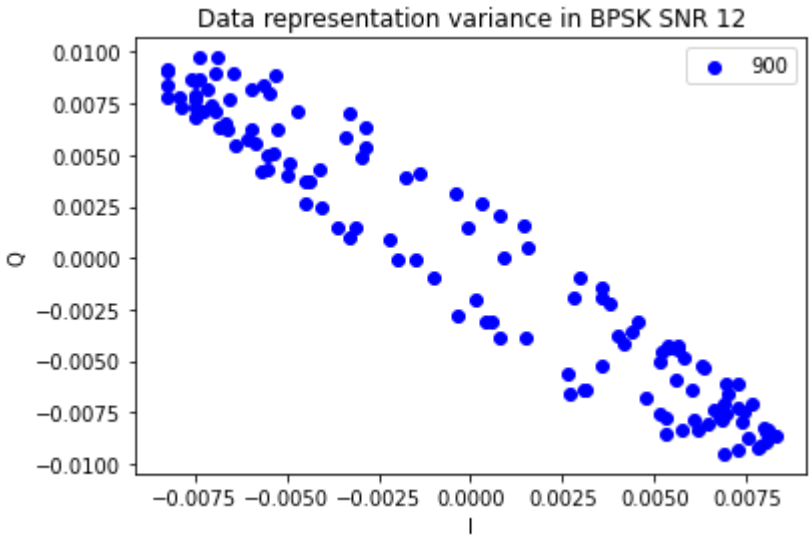
Data representation variance in BPSK SNR 12
900
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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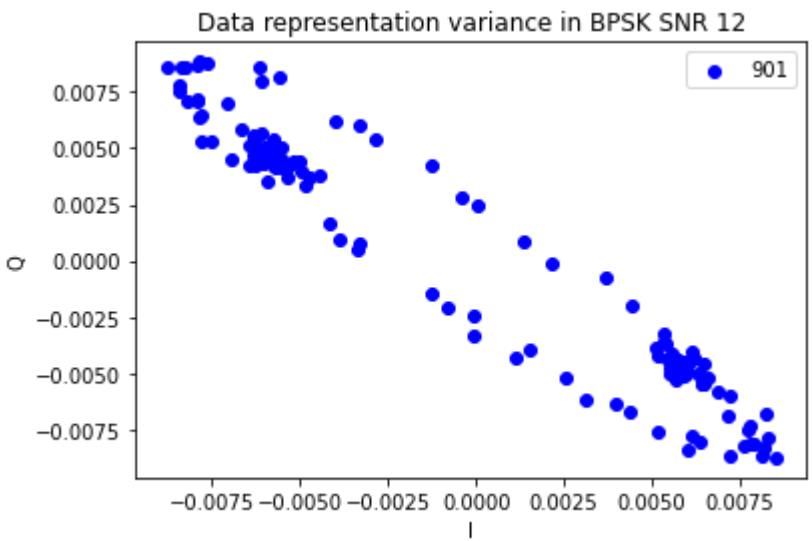
Data representation variance in BPSK SNR 12
901
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
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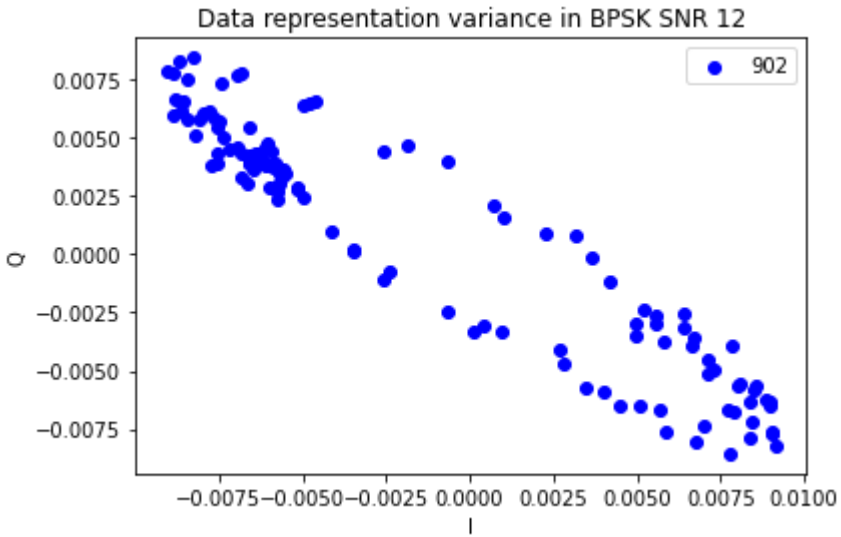
Data representation variance in BPSK SNR 12
902
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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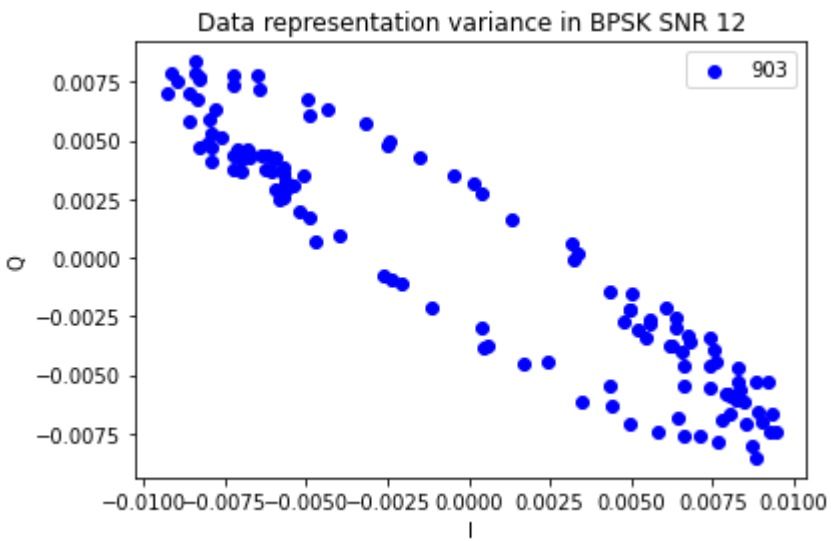
Data representation variance in BPSK SNR 12
903
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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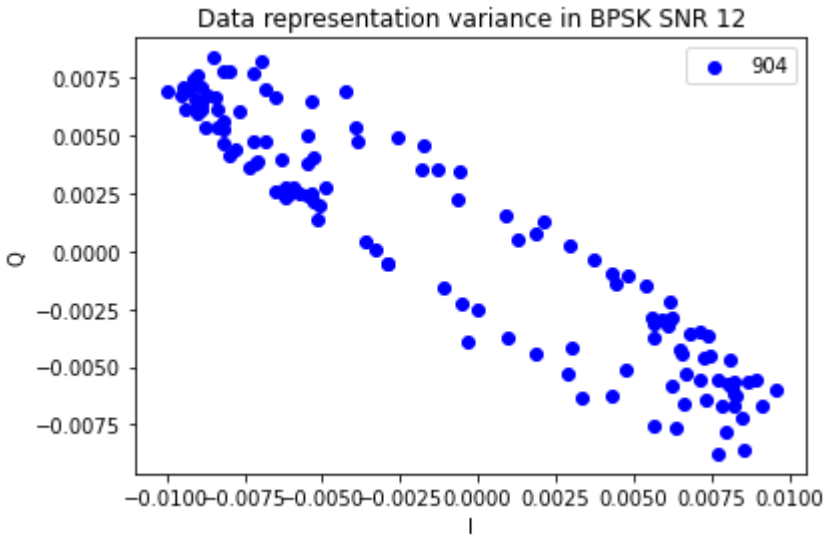
Data representation variance in BPSK SNR 12
904
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0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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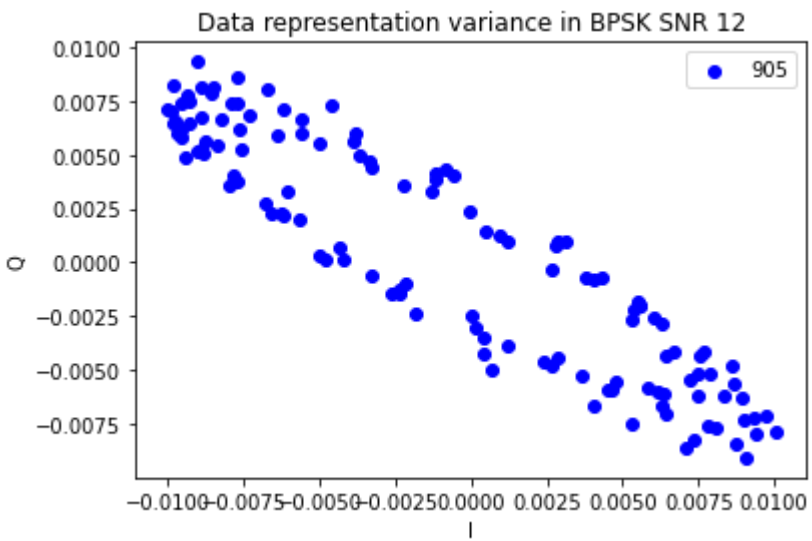
I


Data representation variance in BPSK SNR 12
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0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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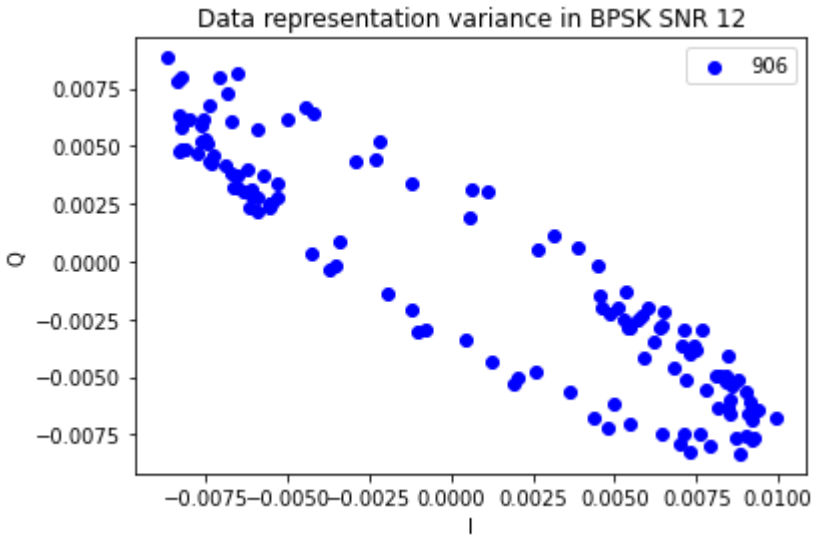
Data representation variance in BPSK SNR 12
906
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0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
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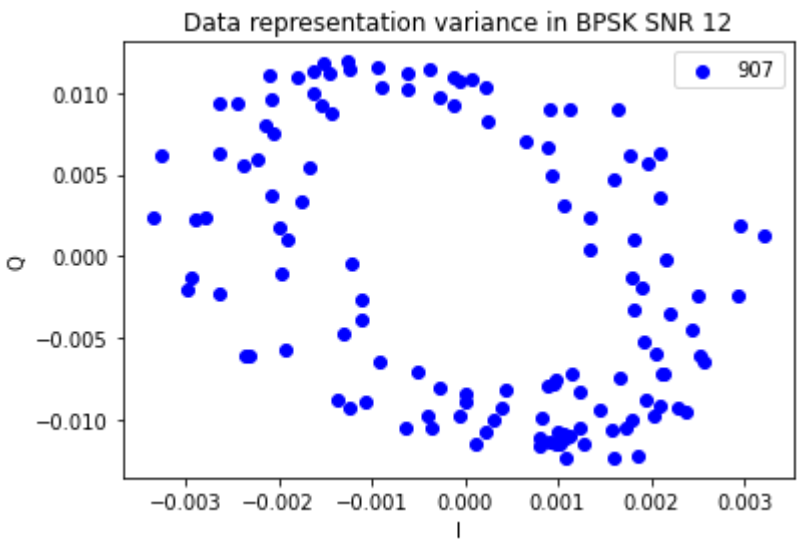
Data representation variance in BPSK SNR 12
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0.010
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0.000
−0.005
−0.010
Q
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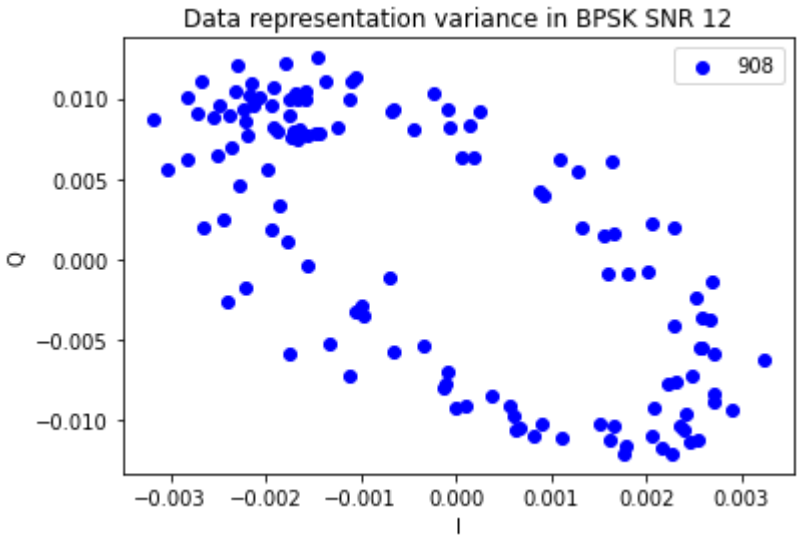
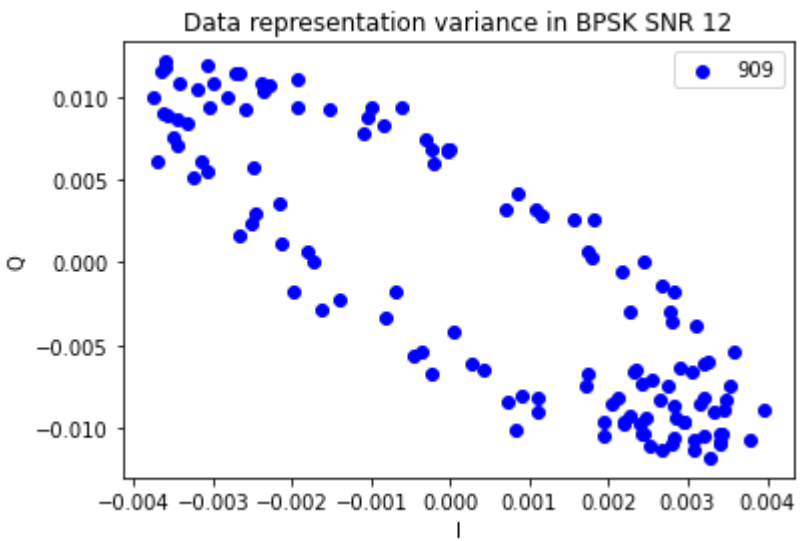
I


Data representation variance in BPSK SNR 12
908
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
909
0.010
0.005
0.000
−0.005
−0.010
Q
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−0.003
−0.002
−0.001
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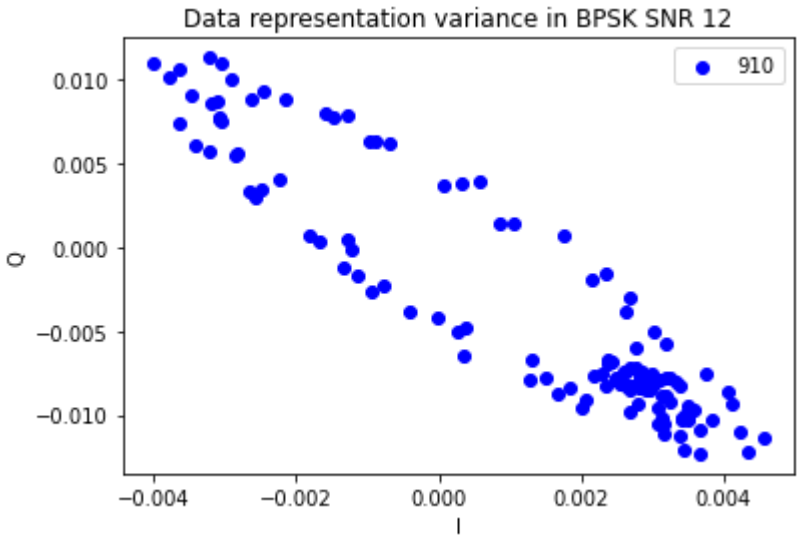
0.001
0.002
0.003
0.004
I


Data representation variance in BPSK SNR 12
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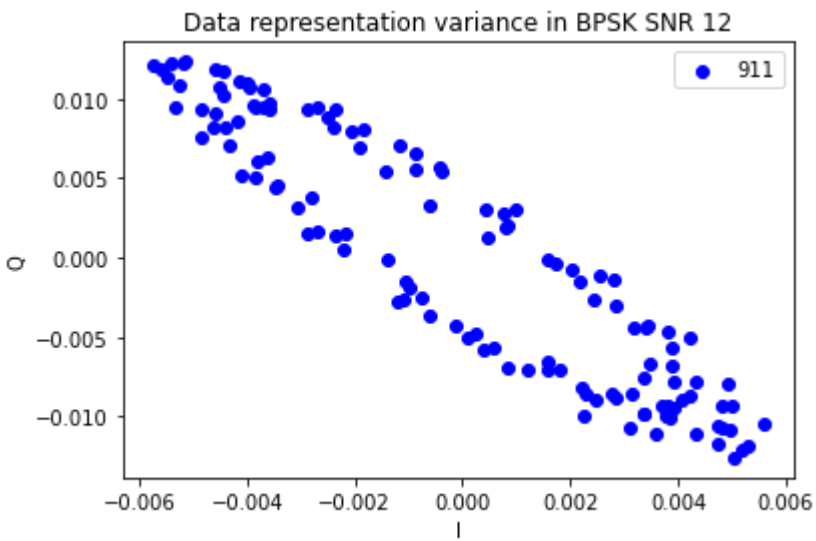
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
911
0.010
0.005
0.000
−0.005
−0.010
Q
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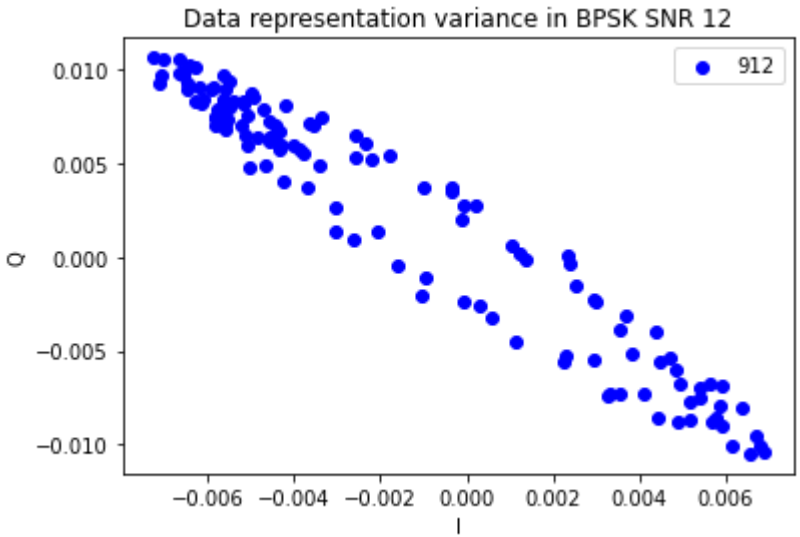
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
912
0.010
0.005
0.000
−0.005
−0.010
Q
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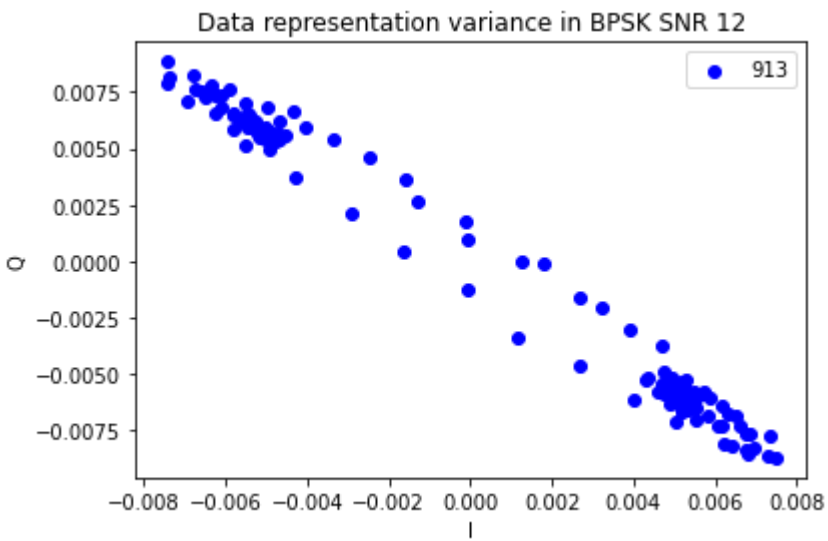
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
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0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
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−0.006
−0.004
−0.002
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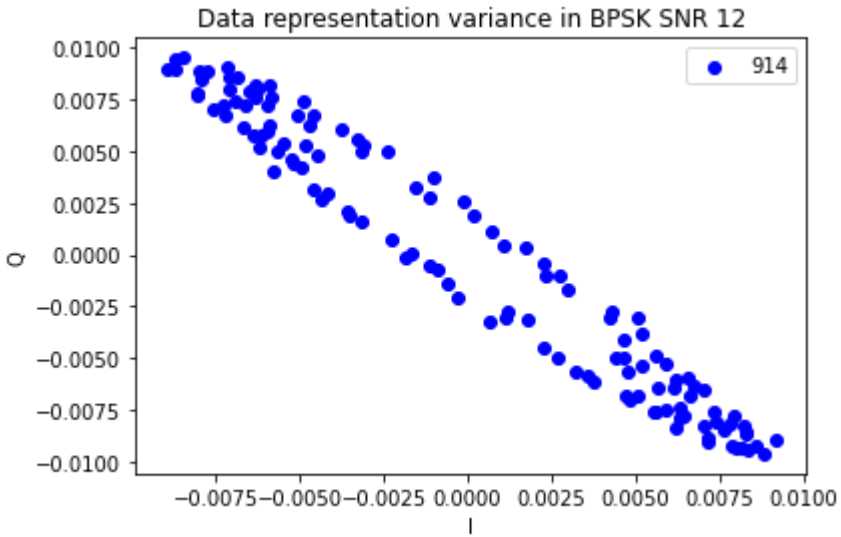
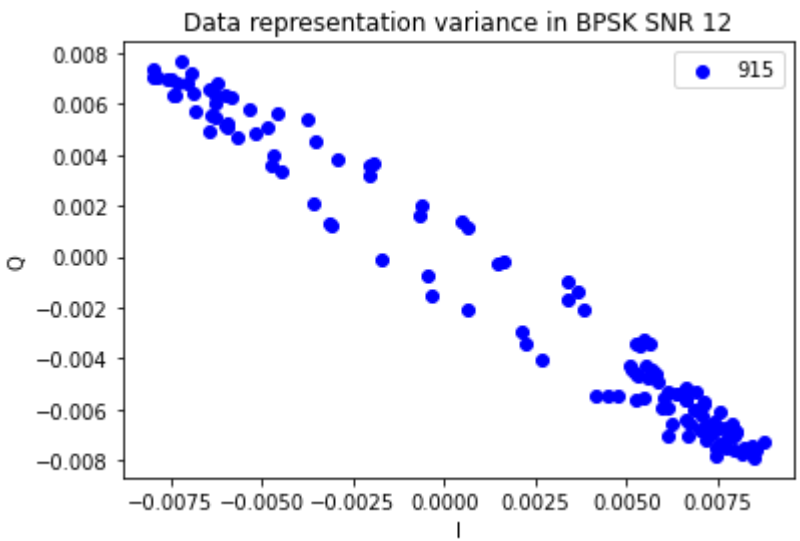
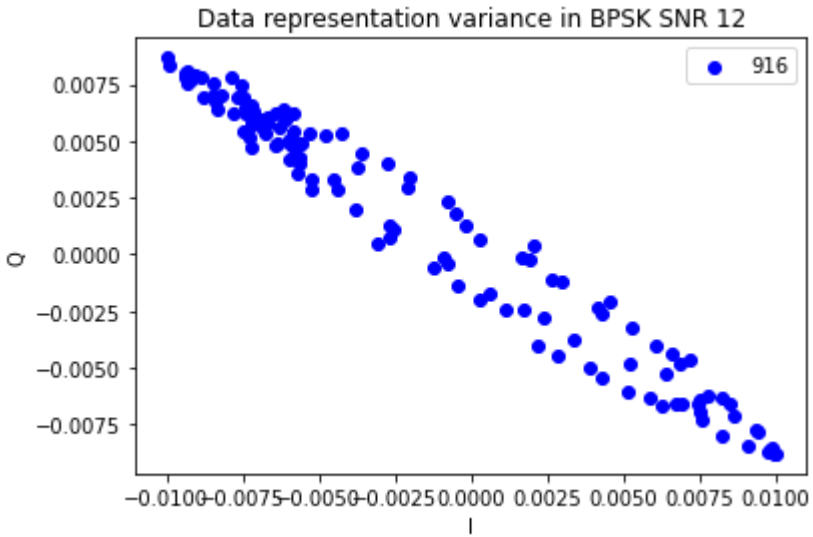
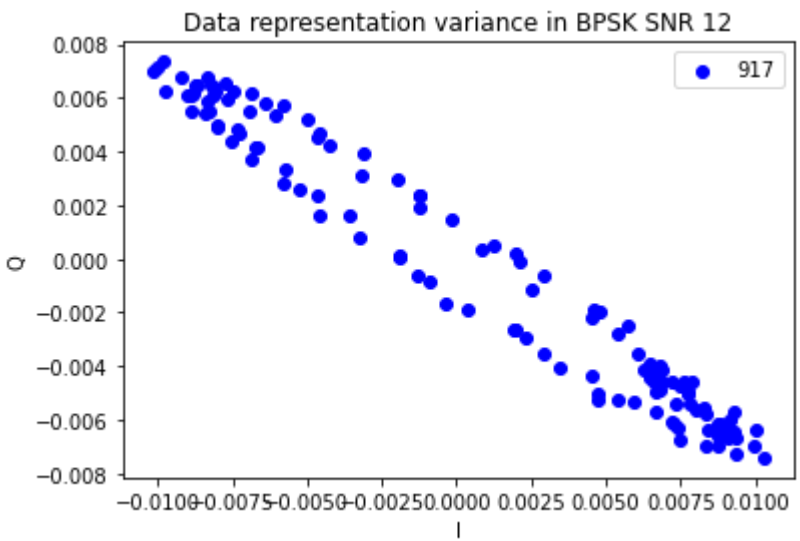
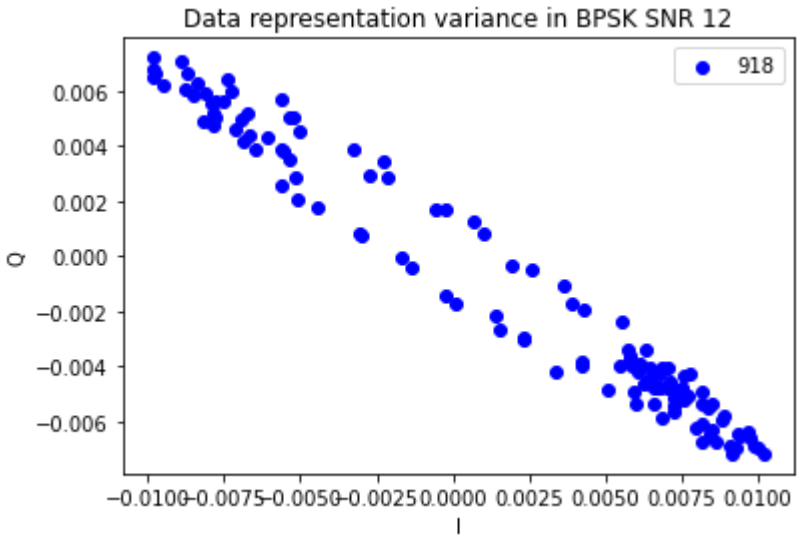
0.002
0.004
0.006
0.008
I

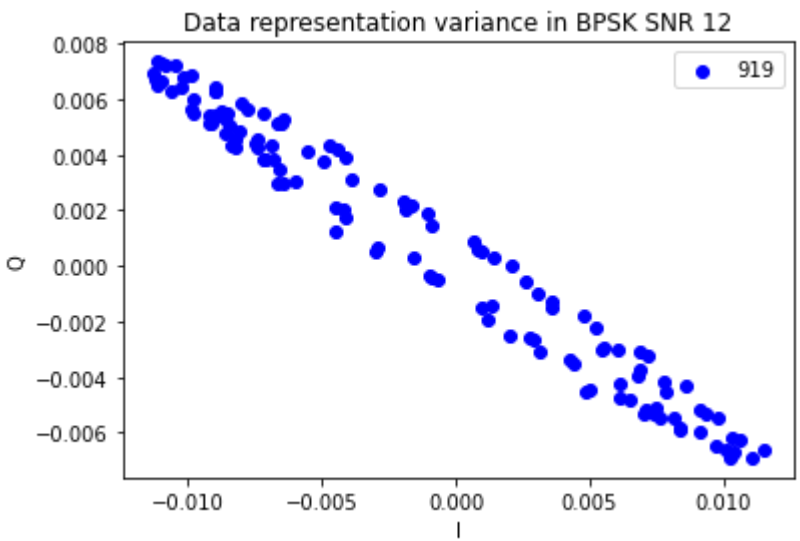

Data representation variance in BPSK SNR 12
914
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

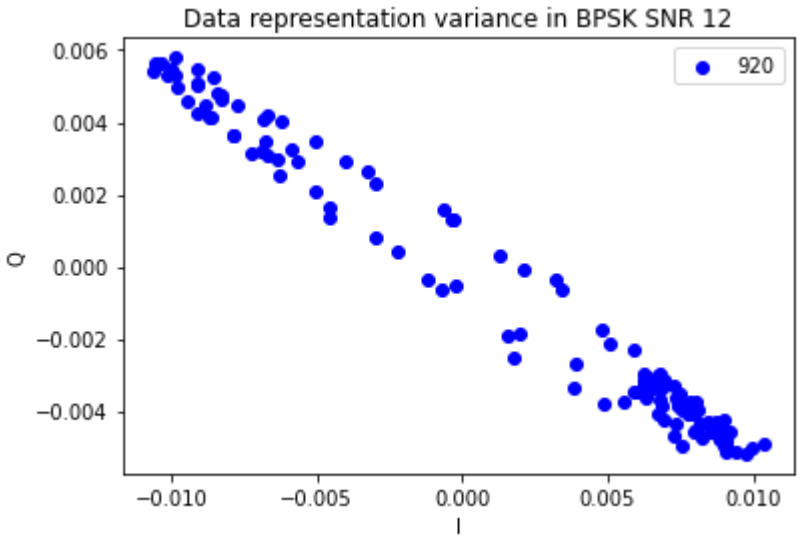

Data representation variance in BPSK SNR 12
915
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

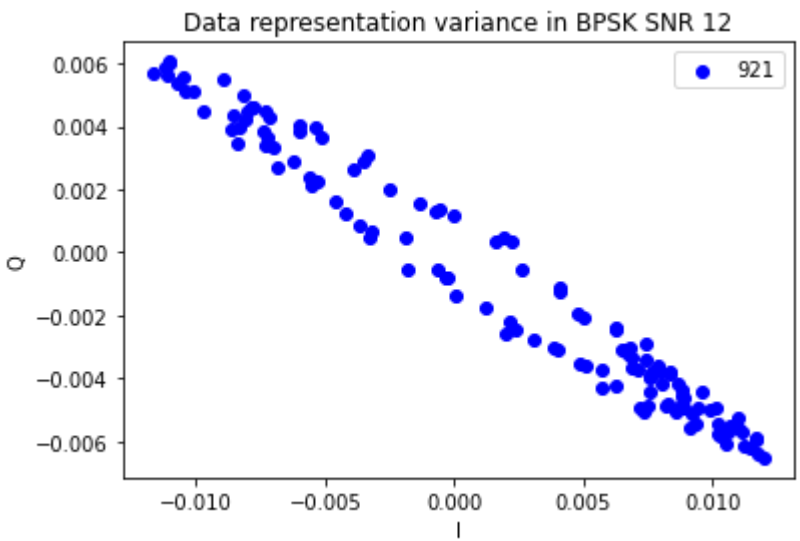

Data representation variance in BPSK SNR 12
916
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

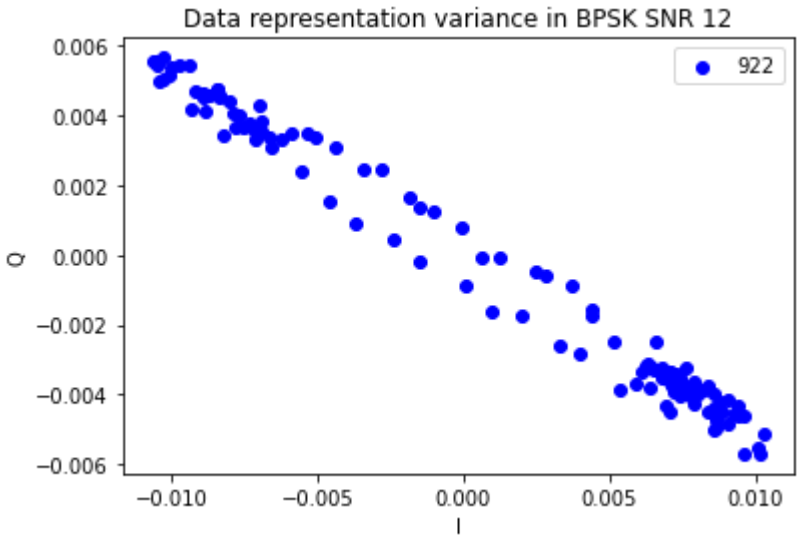

Data representation variance in BPSK SNR 12
917
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

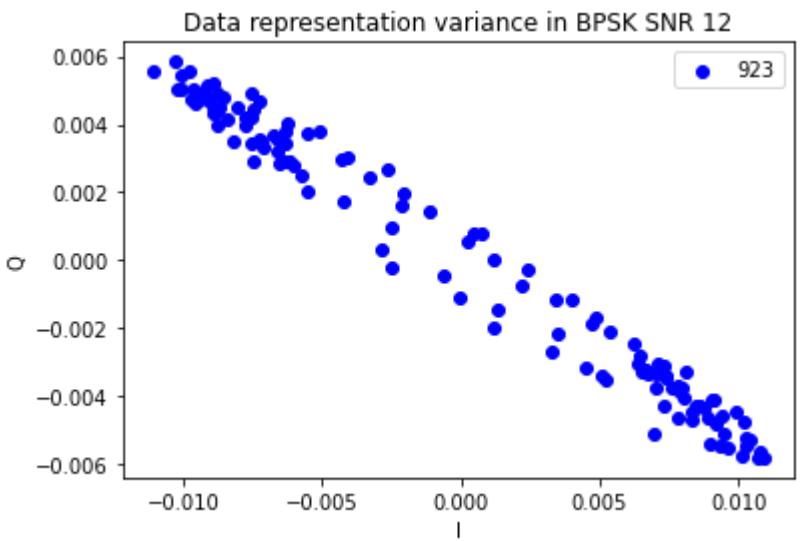

Data representation variance in BPSK SNR 12
918
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

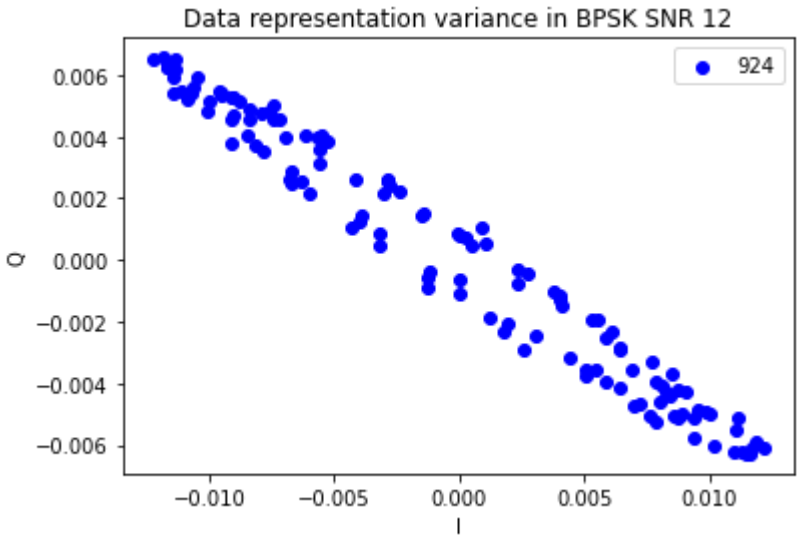

Data representation variance in BPSK SNR 12
919
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010 −0.005 0.000 0.005 0.010
I

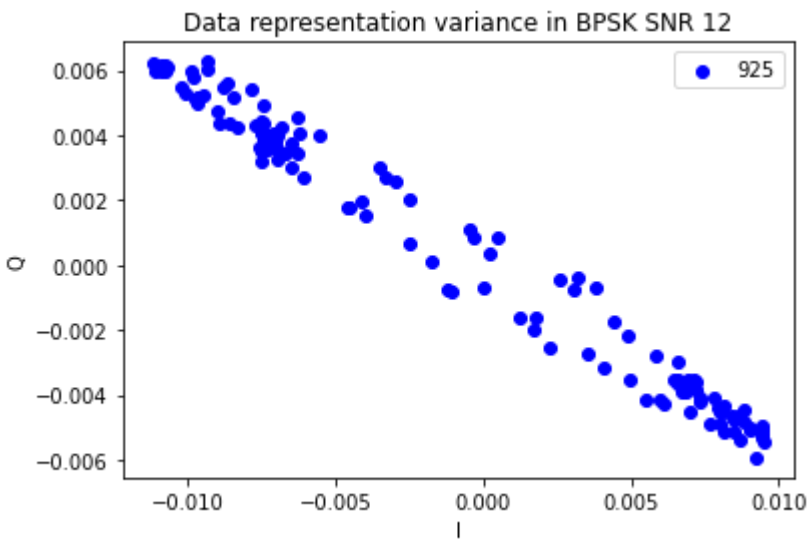

Data representation variance in BPSK SNR 12
920
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

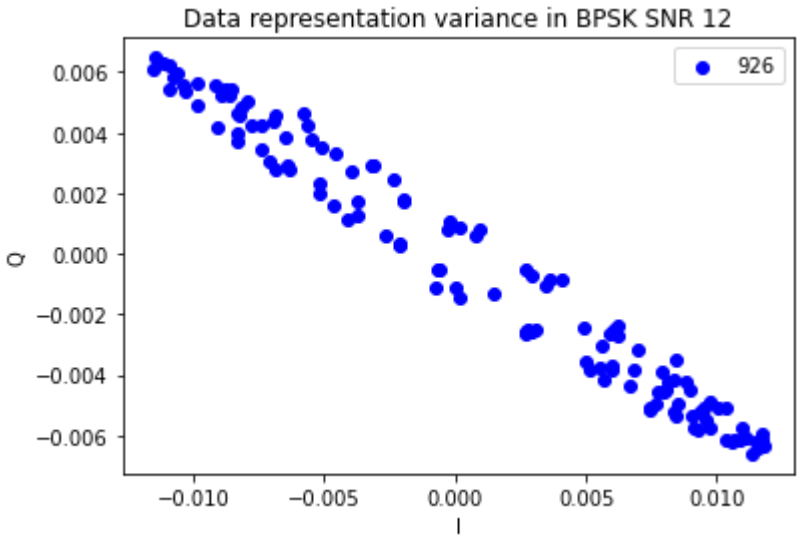

Data representation variance in BPSK SNR 12
921
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

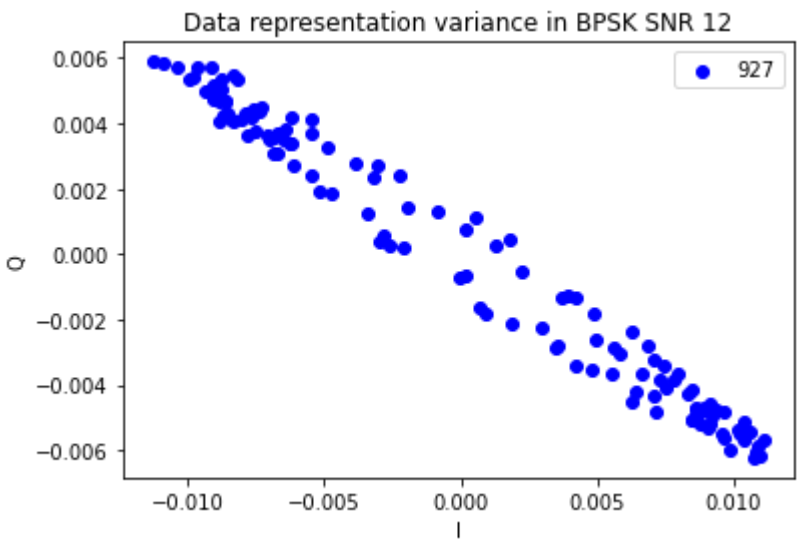

Data representation variance in BPSK SNR 12
922
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

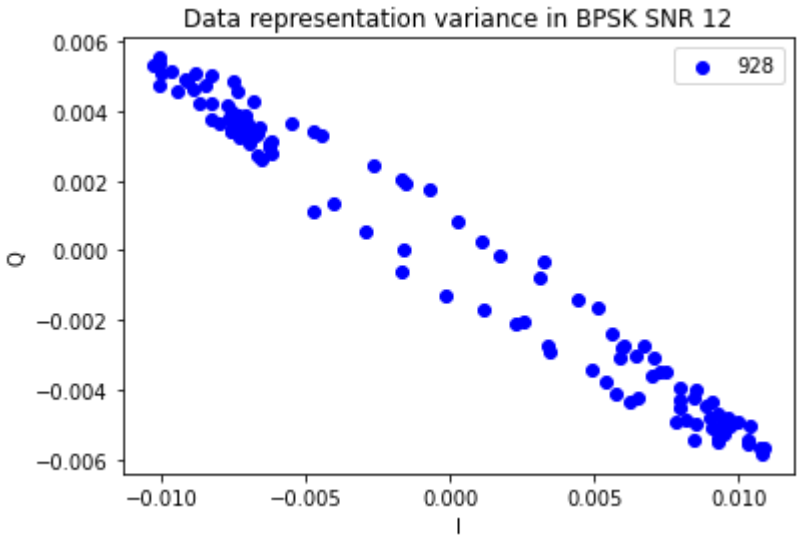

Data representation variance in BPSK SNR 12
923
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

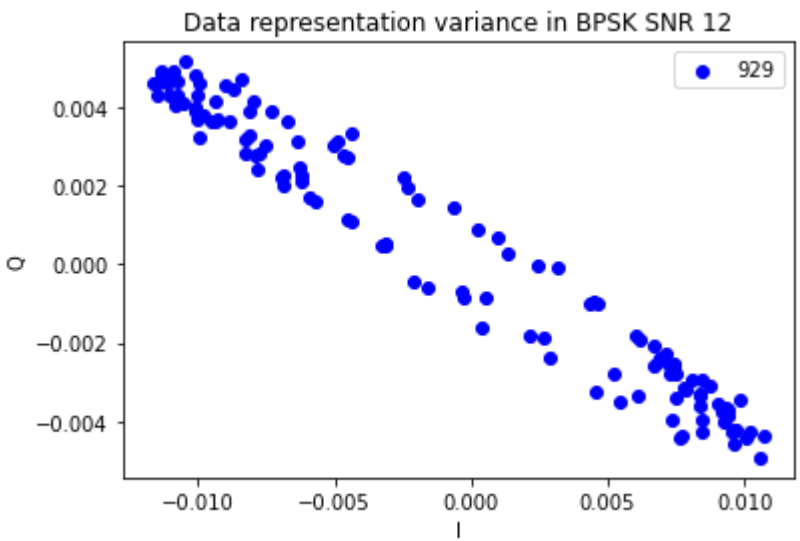

Data representation variance in BPSK SNR 12
924
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

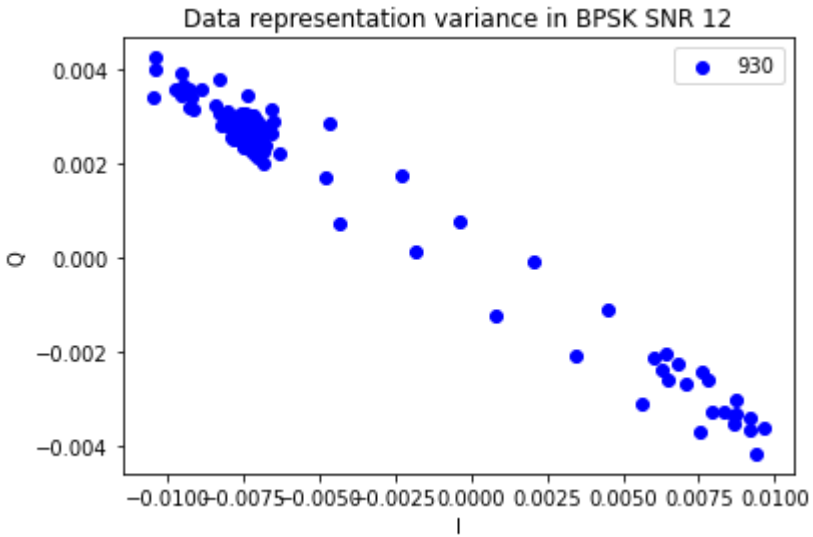

Data representation variance in BPSK SNR 12
925
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

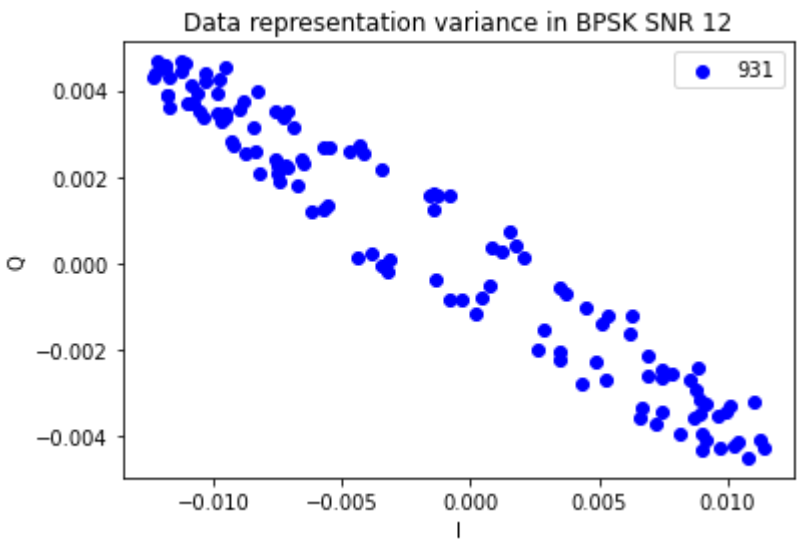

Data representation variance in BPSK SNR 12
926
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

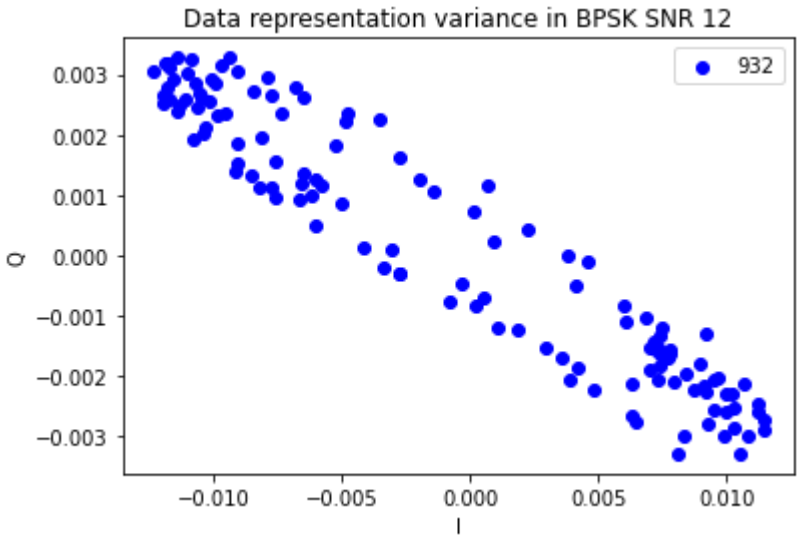

Data representation variance in BPSK SNR 12
927
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

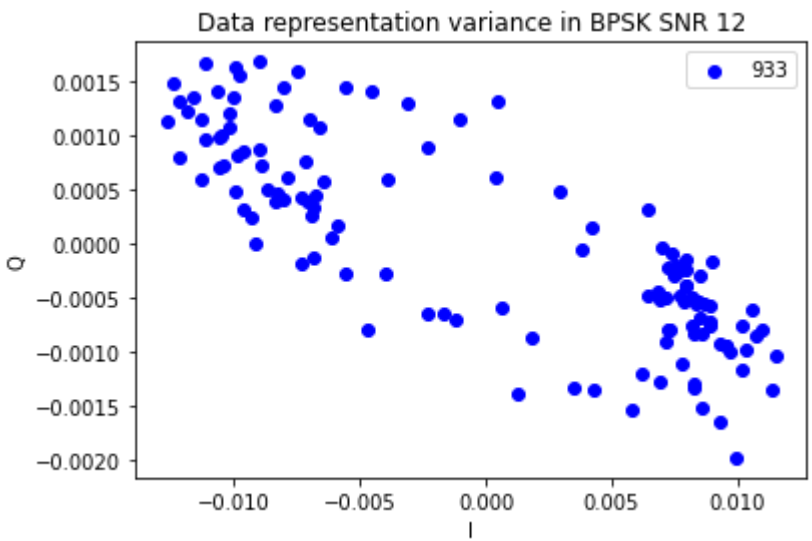

Data representation variance in BPSK SNR 12
928
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

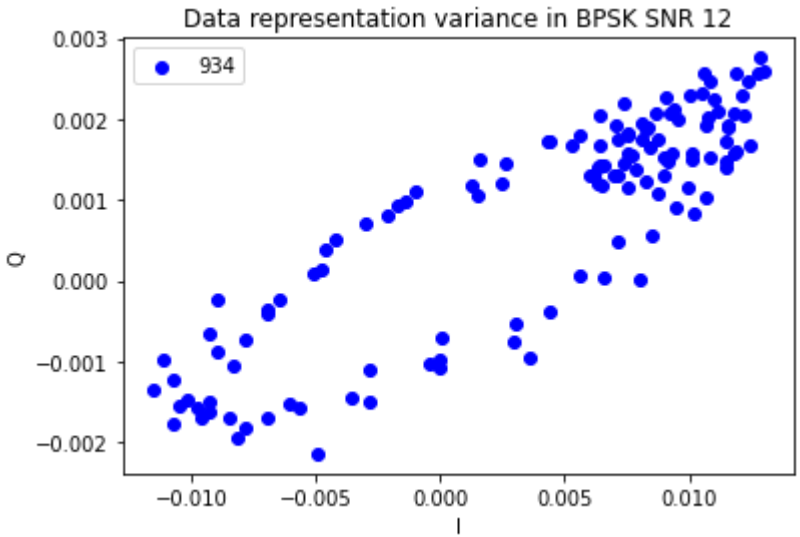

Data representation variance in BPSK SNR 12
929
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

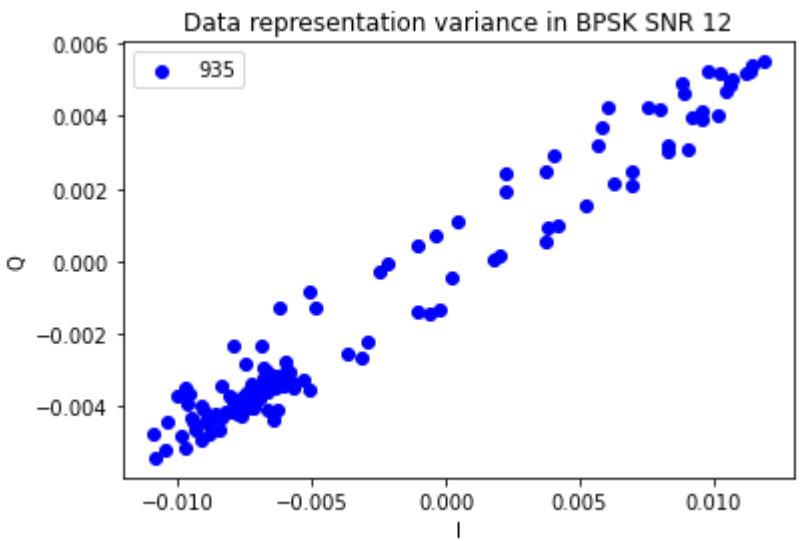

Data representation variance in BPSK SNR 12
930
0.004
0.002
0.000
−0.002
−0.004
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

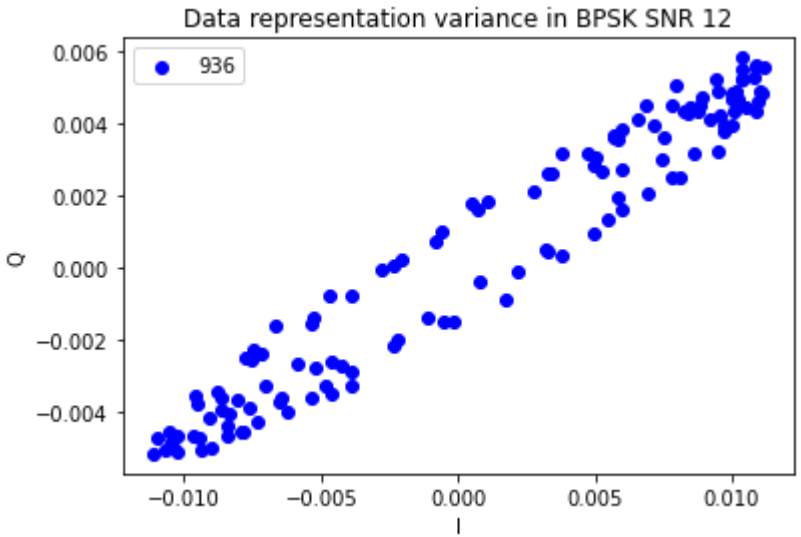

Data representation variance in BPSK SNR 12
931
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

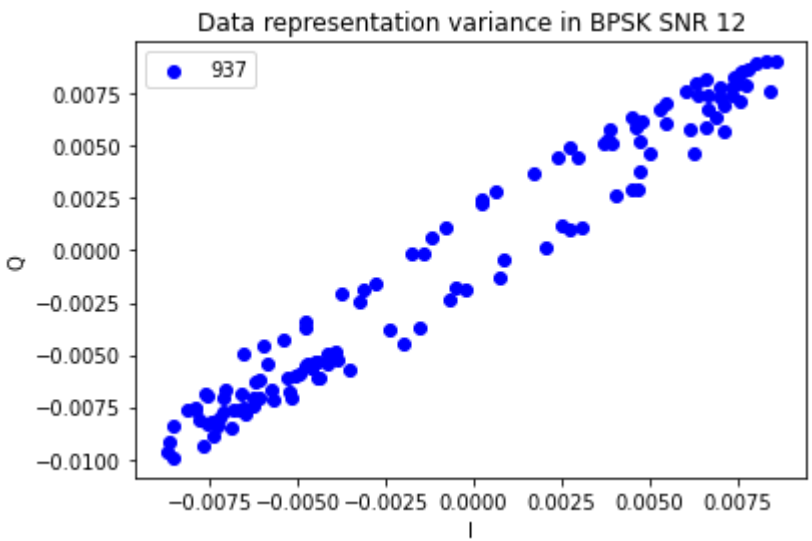

Data representation variance in BPSK SNR 12
932
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

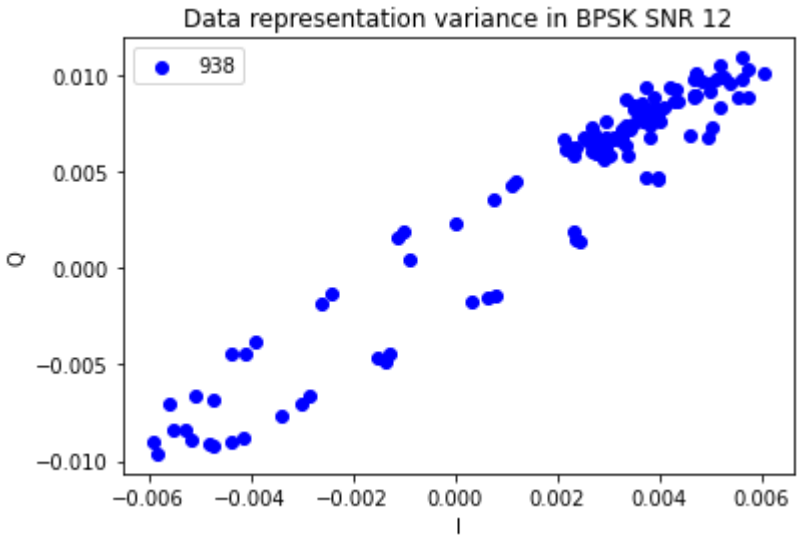

Data representation variance in BPSK SNR 12
933
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I

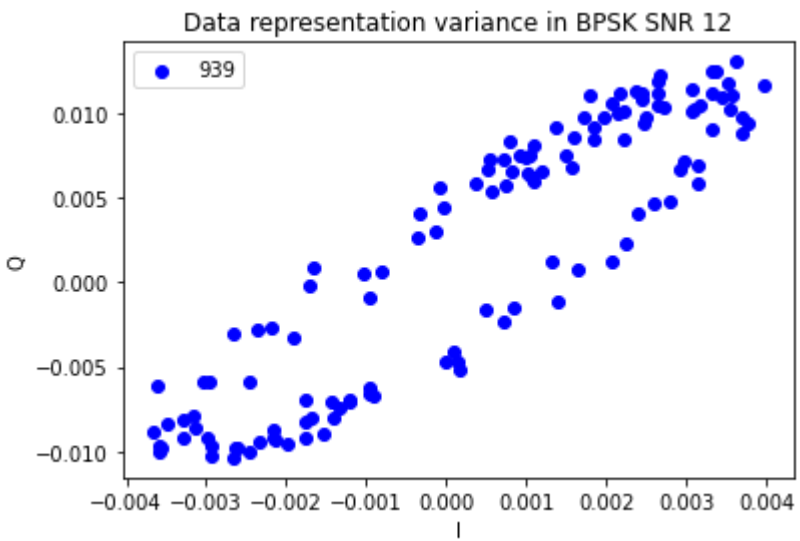

Data representation variance in BPSK SNR 12
934
0.003
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

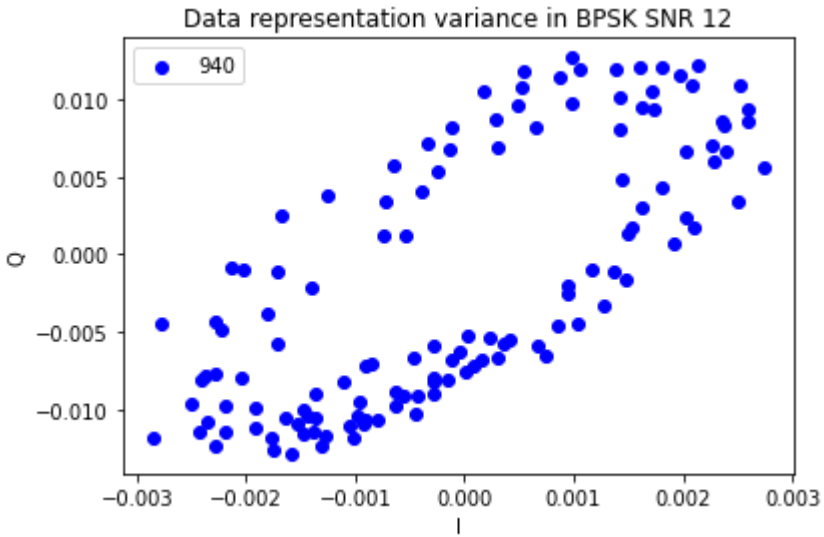

Data representation variance in BPSK SNR 12
935
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

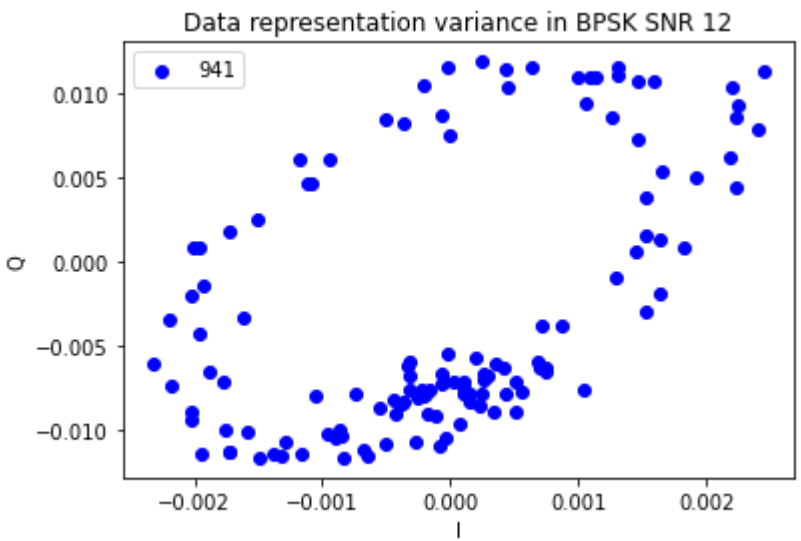

Data representation variance in BPSK SNR 12
936
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

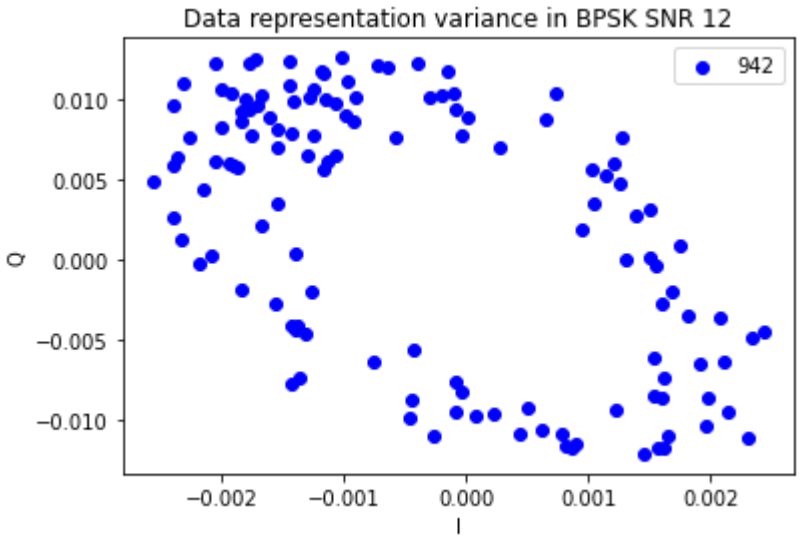

Data representation variance in BPSK SNR 12
937
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
I

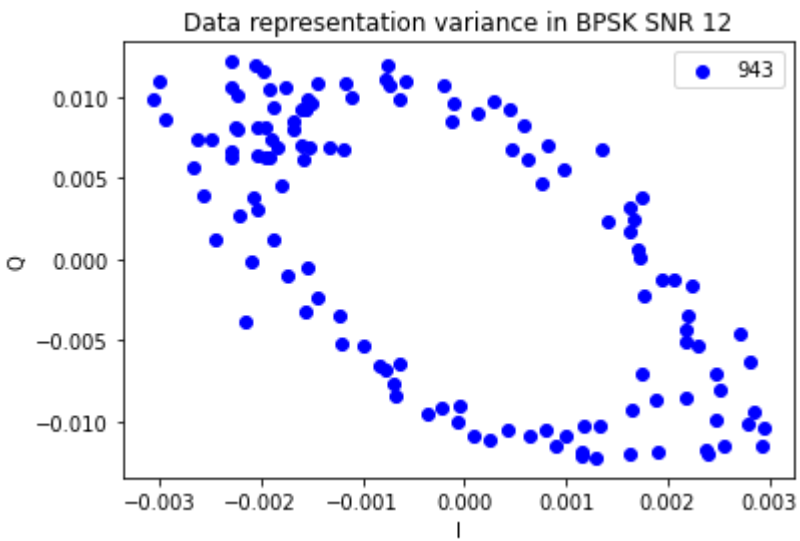

Data representation variance in BPSK SNR 12
938
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

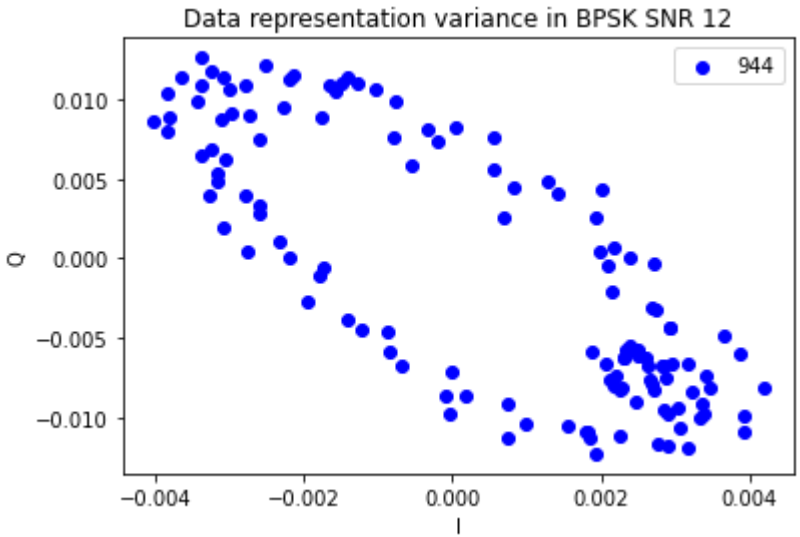

Data representation variance in BPSK SNR 12
939
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I

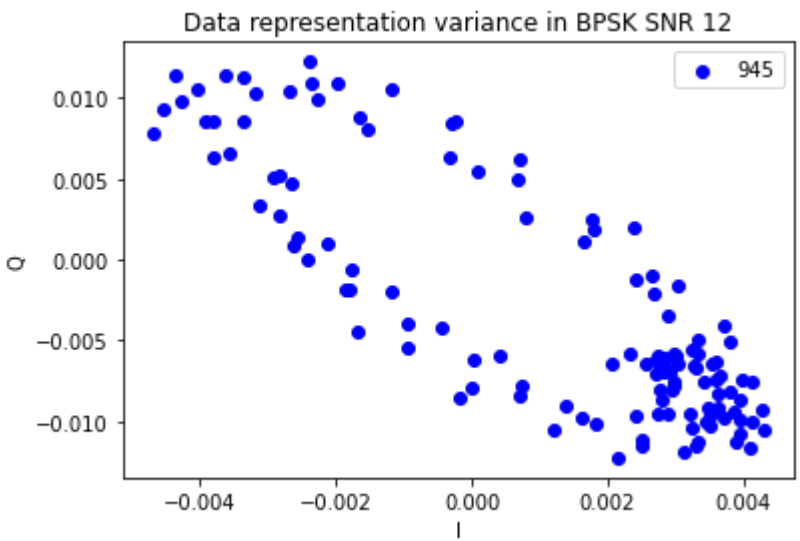

Data representation variance in BPSK SNR 12
940
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

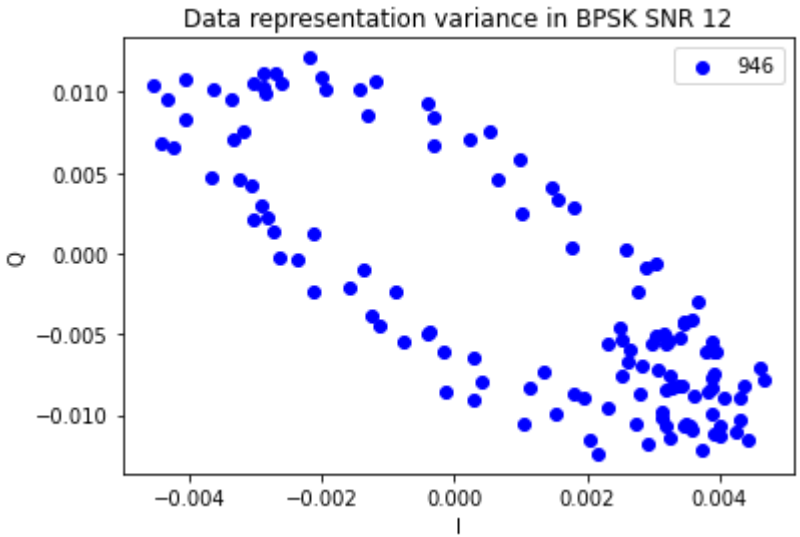

Data representation variance in BPSK SNR 12
941
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

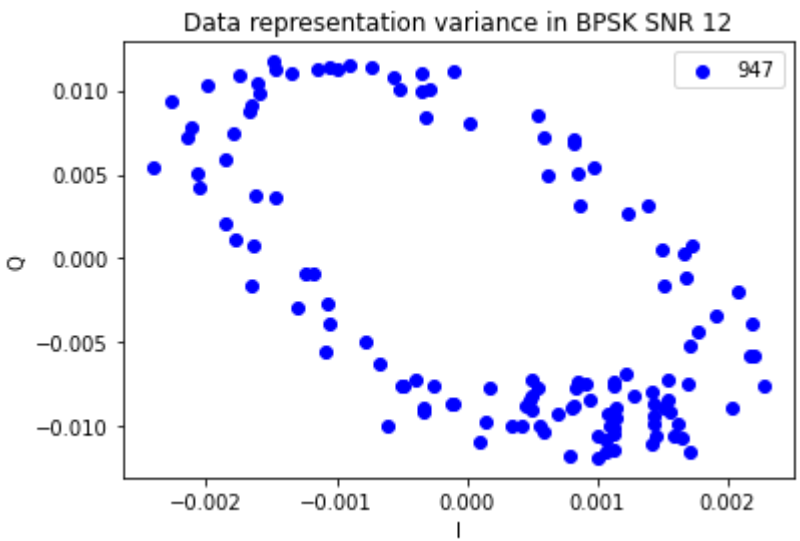

Data representation variance in BPSK SNR 12
942
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

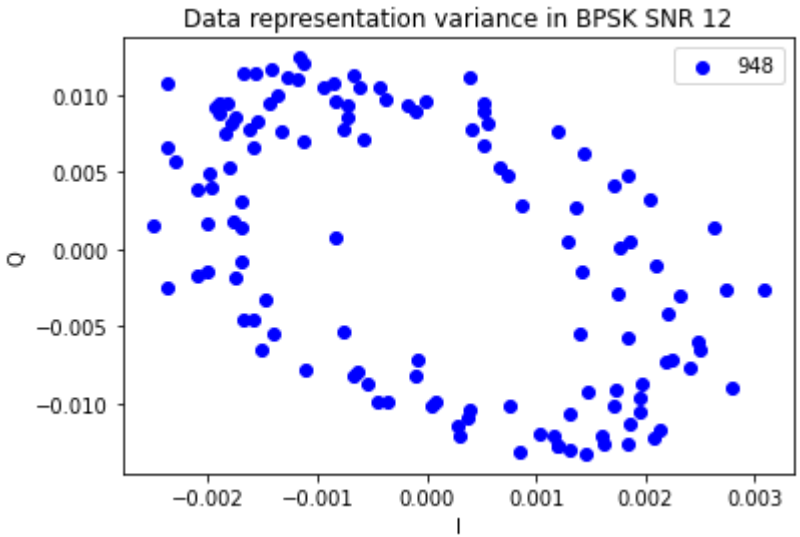

Data representation variance in BPSK SNR 12
943
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

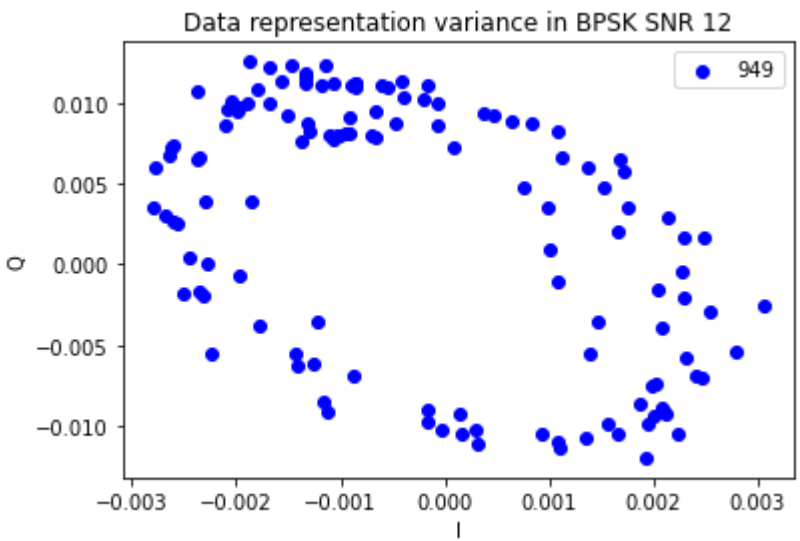

Data representation variance in BPSK SNR 12
944
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

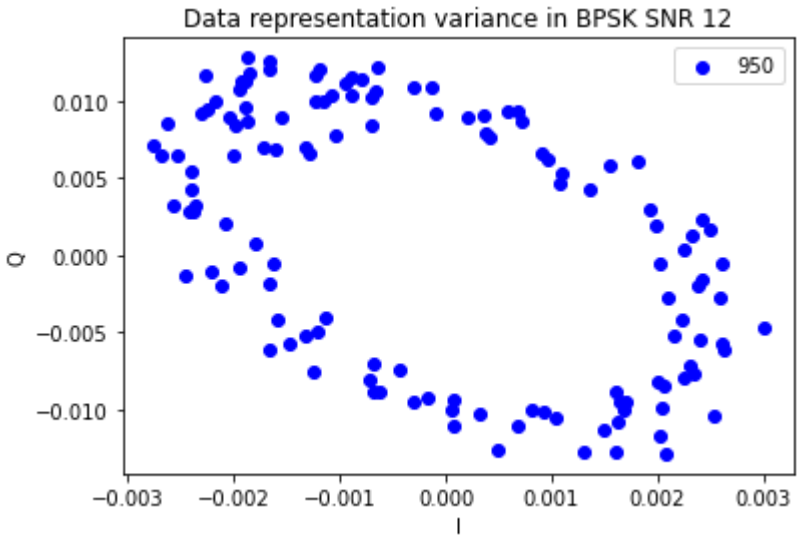

Data representation variance in BPSK SNR 12
945
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

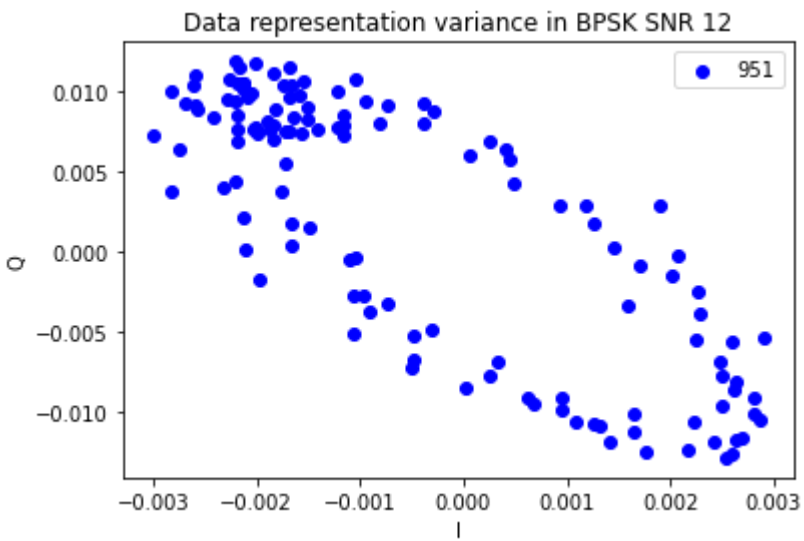

Data representation variance in BPSK SNR 12
946
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
947
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I


Data representation variance in BPSK SNR 12
948
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
949
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
950
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
951
0.010
0.005
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−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
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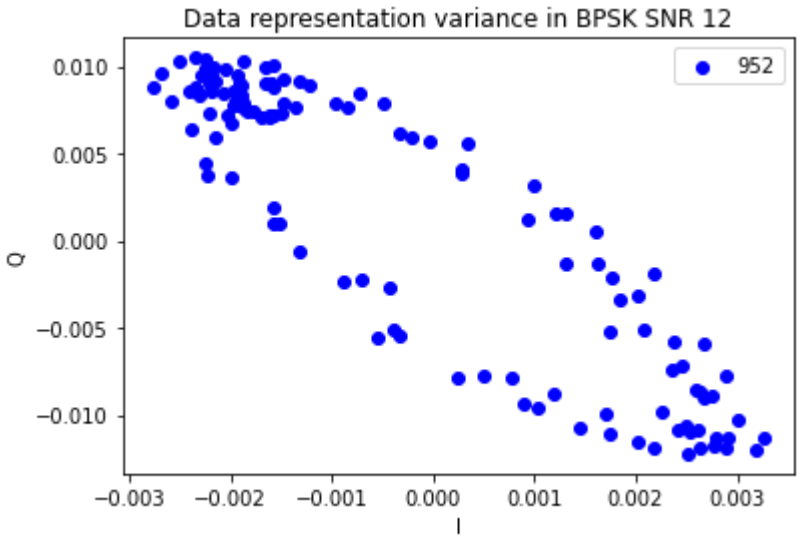
Data representation variance in BPSK SNR 12
952
0.010
0.005
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−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
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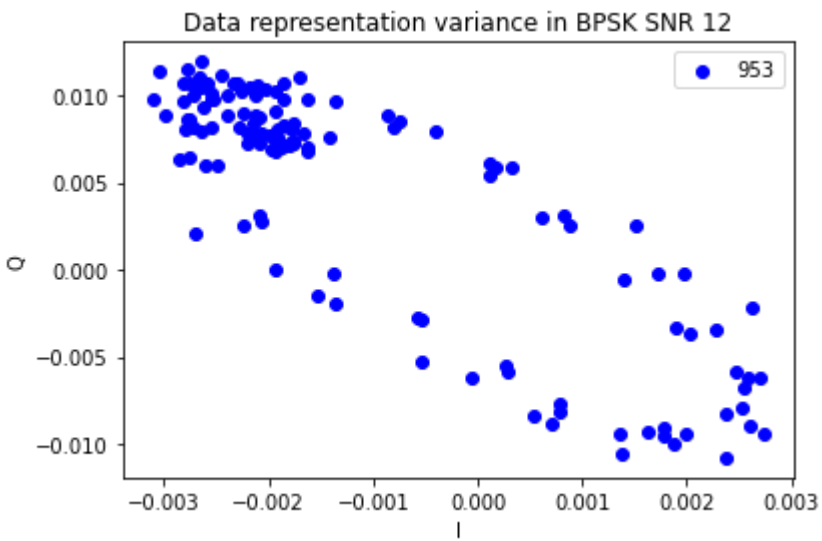
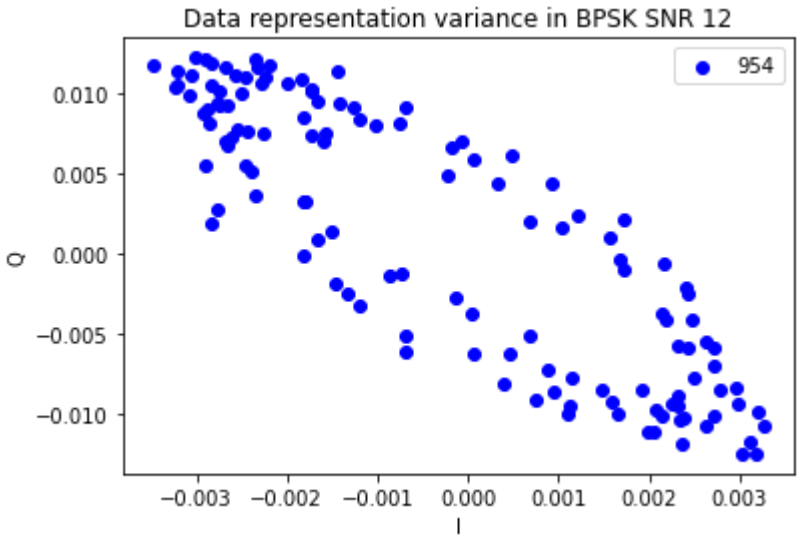

Data representation variance in BPSK SNR 12
953
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
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0.010
0.005
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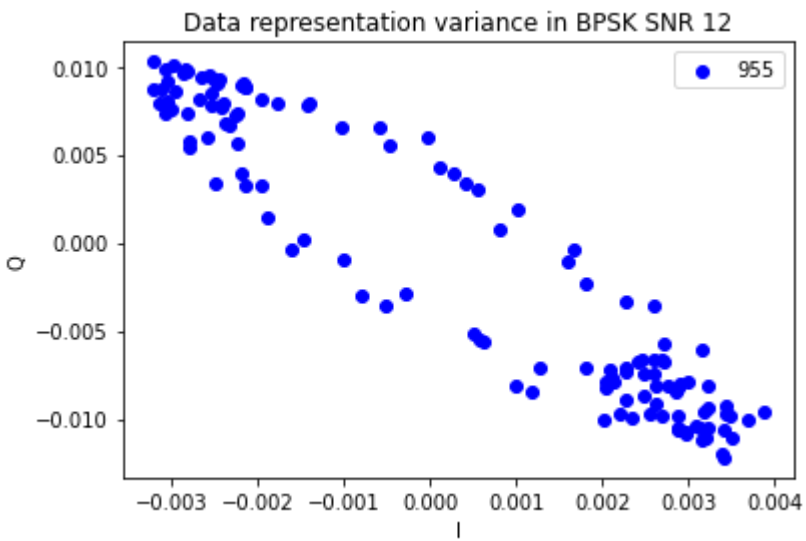
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I


Data representation variance in BPSK SNR 12
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0.010
0.005
0.000
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−0.010
Q
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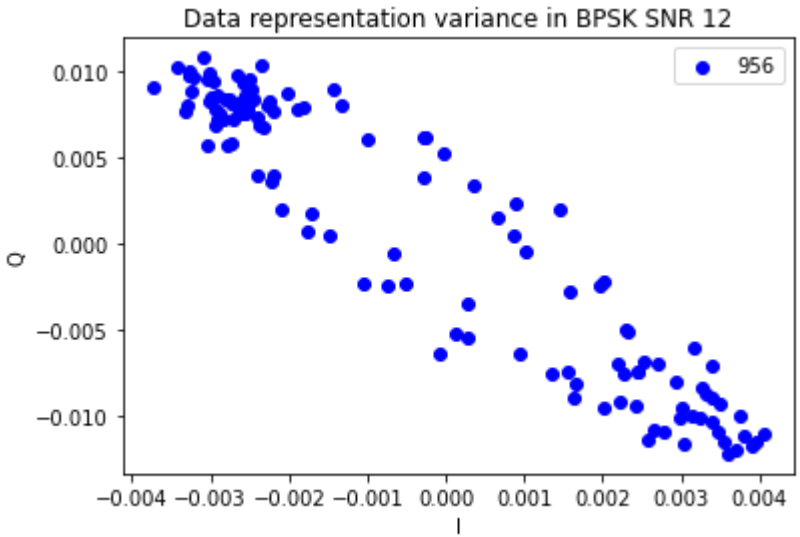
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I


Data representation variance in BPSK SNR 12
956
0.010
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0.000
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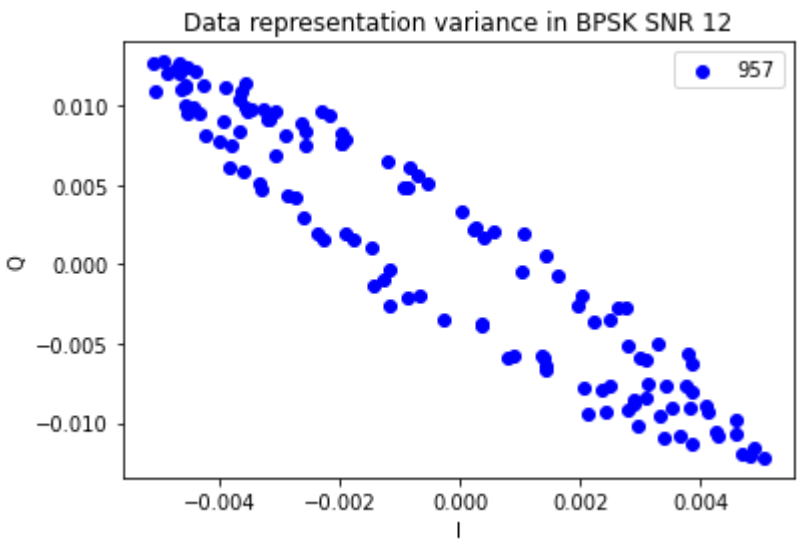
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I


Data representation variance in BPSK SNR 12
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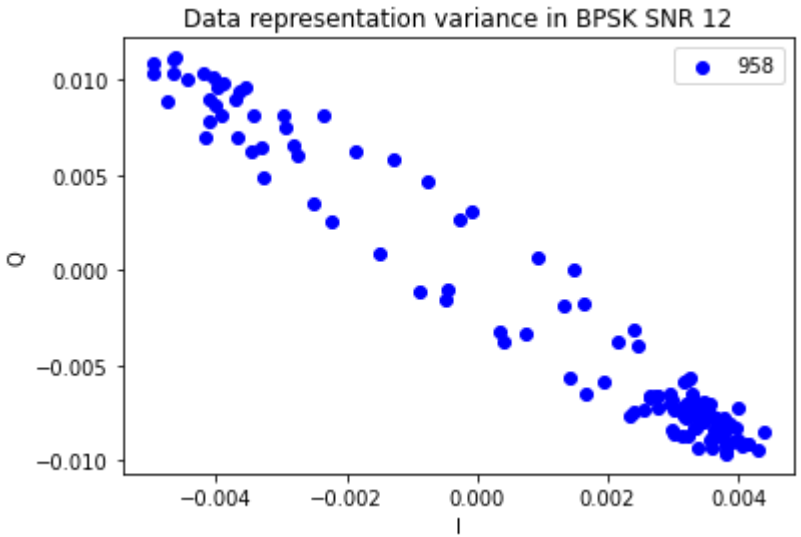
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I


Data representation variance in BPSK SNR 12
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−0.005
−0.010
Q
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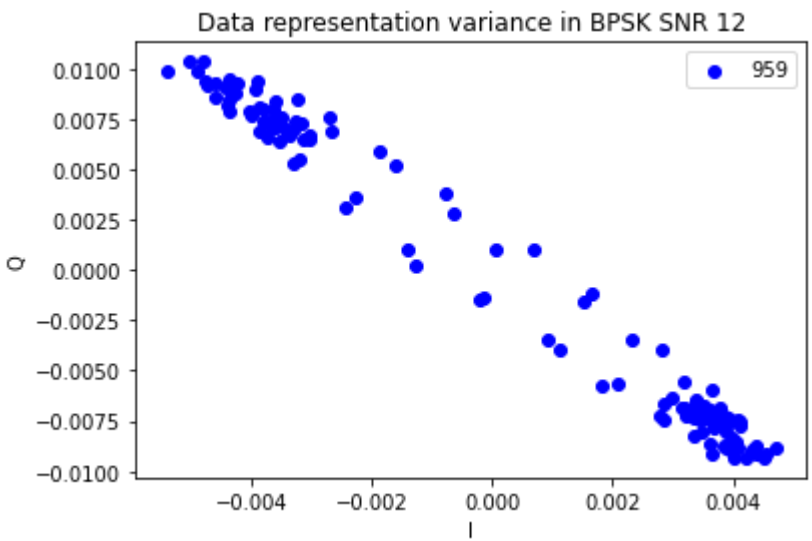
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
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0.0075
0.0050
0.0025
0.0000
−0.0025
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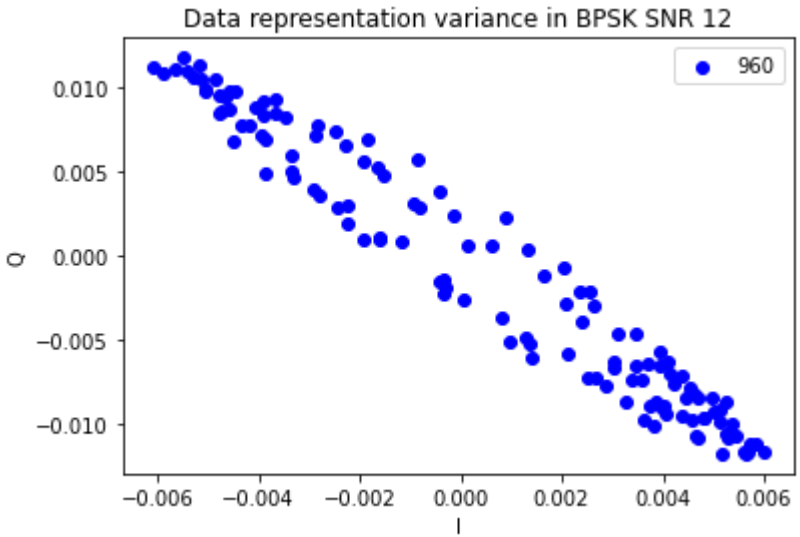
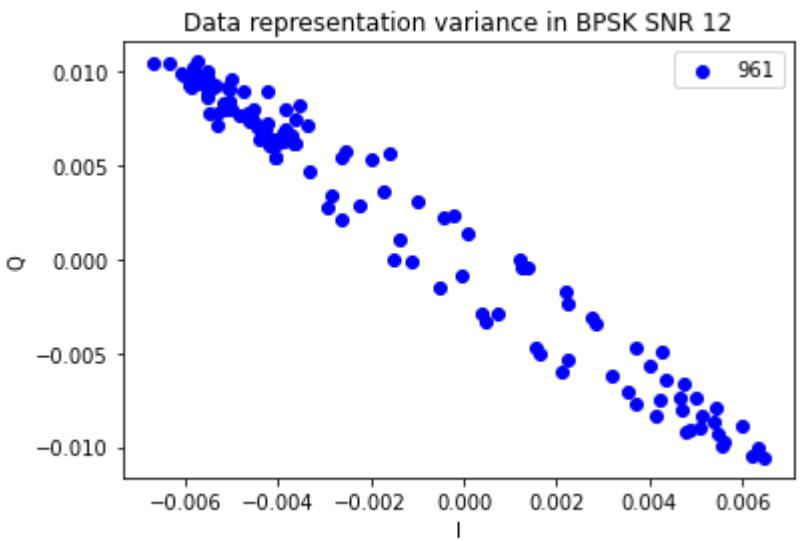
−0.0075
−0.0100
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
960
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
961
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0.005
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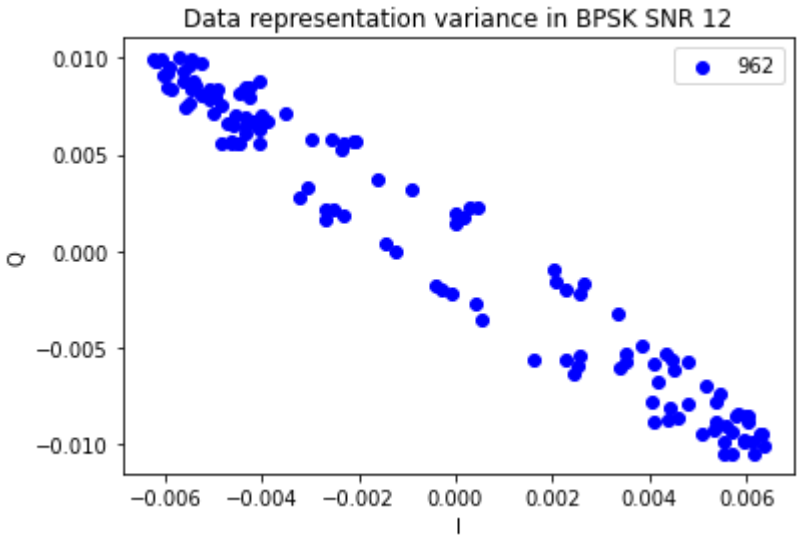
0.006
I


Data representation variance in BPSK SNR 12
962
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0.005
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−0.010
Q
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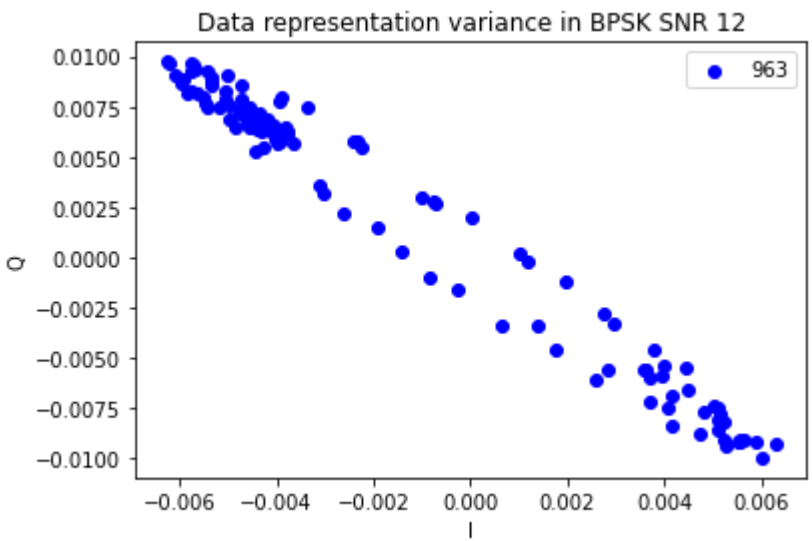
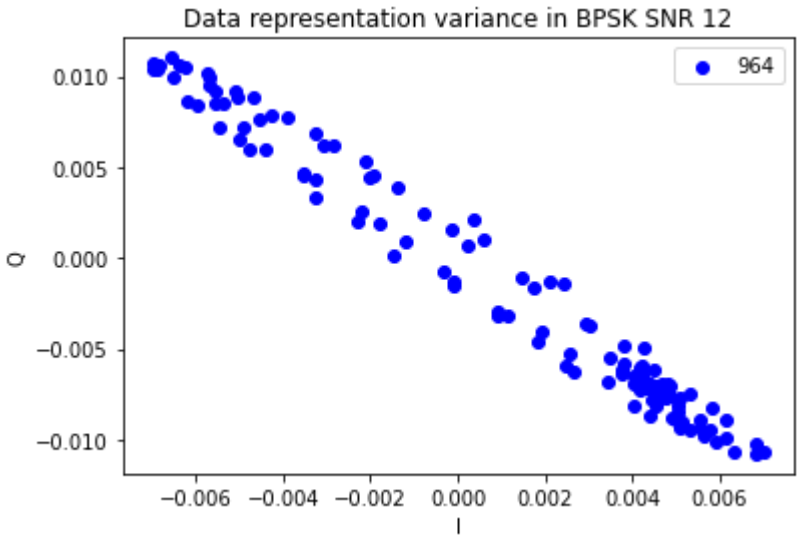
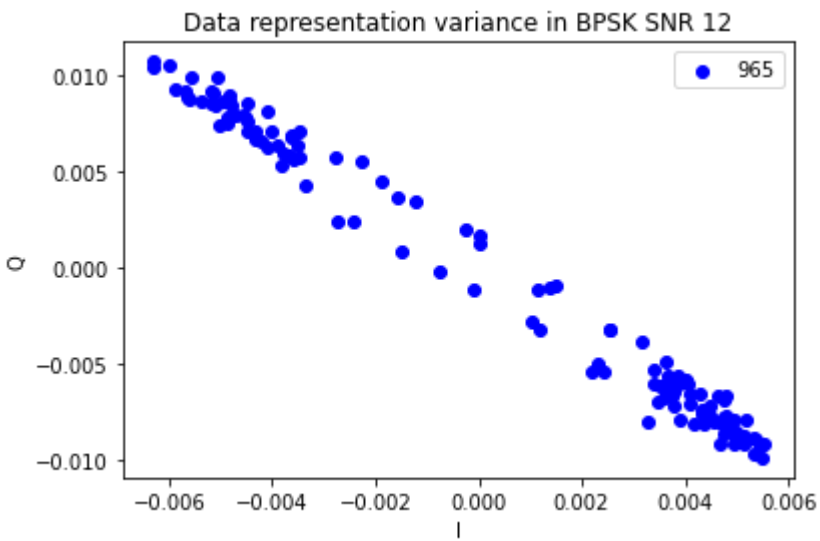
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
963
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
964
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
965
0.010
0.005
0.000
−0.005
−0.010
Q
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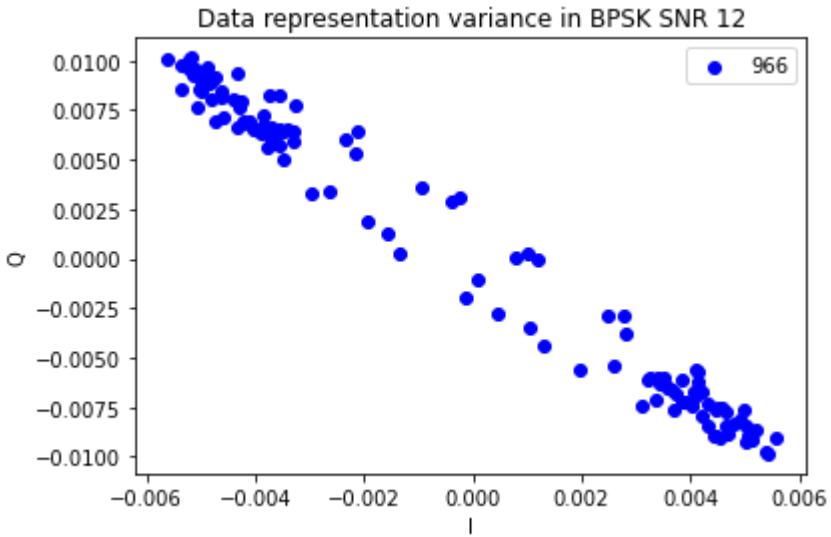
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
966
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
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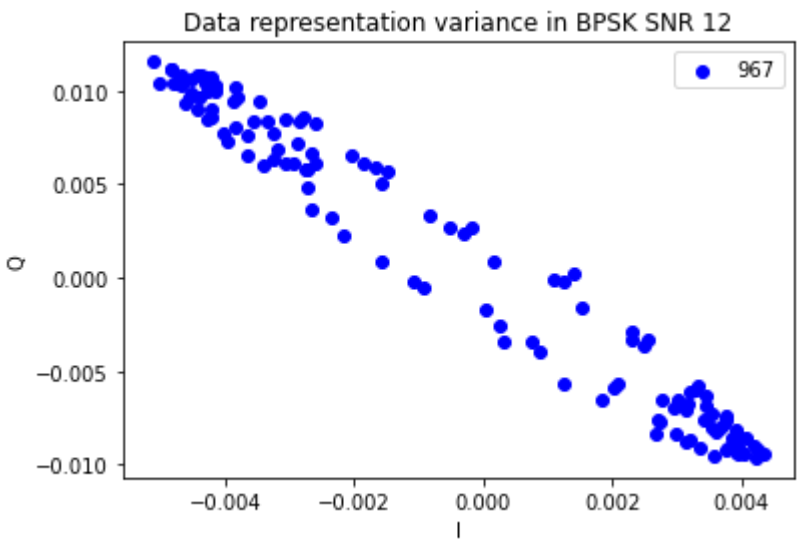
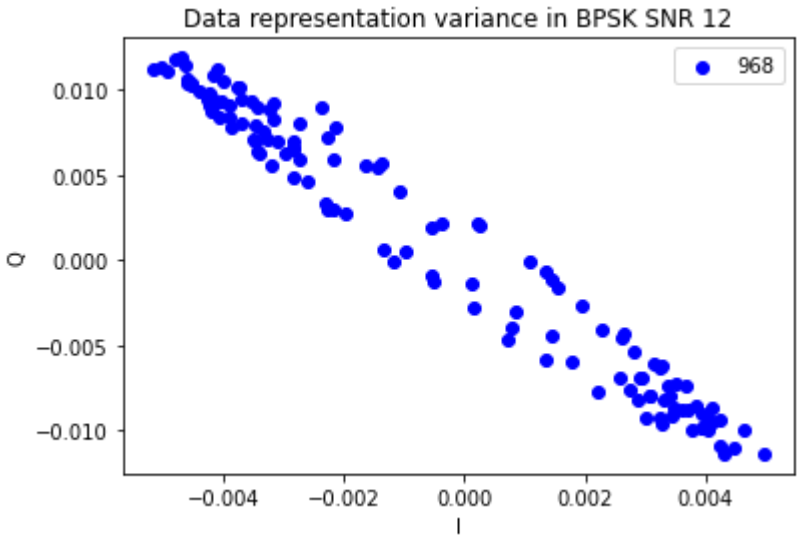
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
967
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
968
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0.000
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−0.010
Q
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−0.002
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0.004
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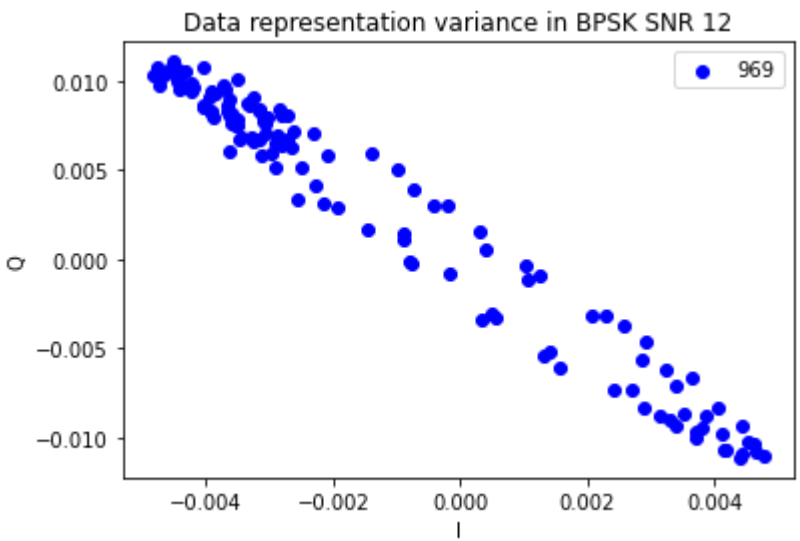
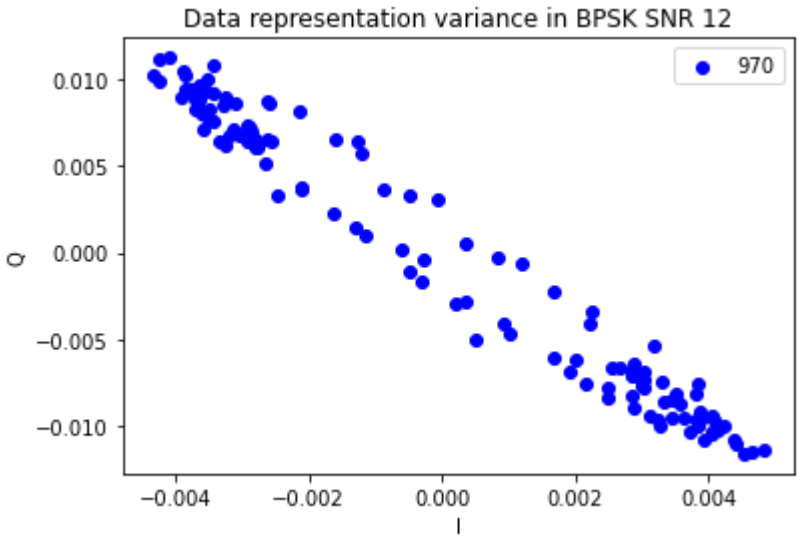
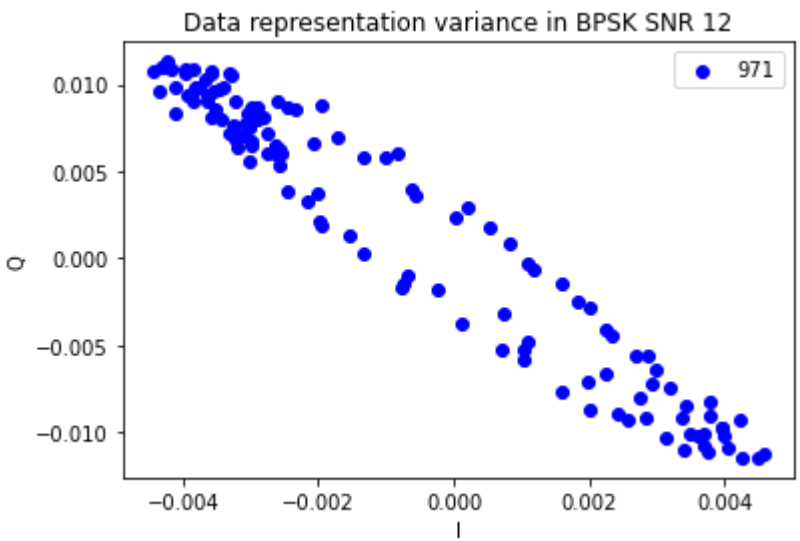

Data representation variance in BPSK SNR 12
969
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
970
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
971
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0.000
−0.005
−0.010
Q
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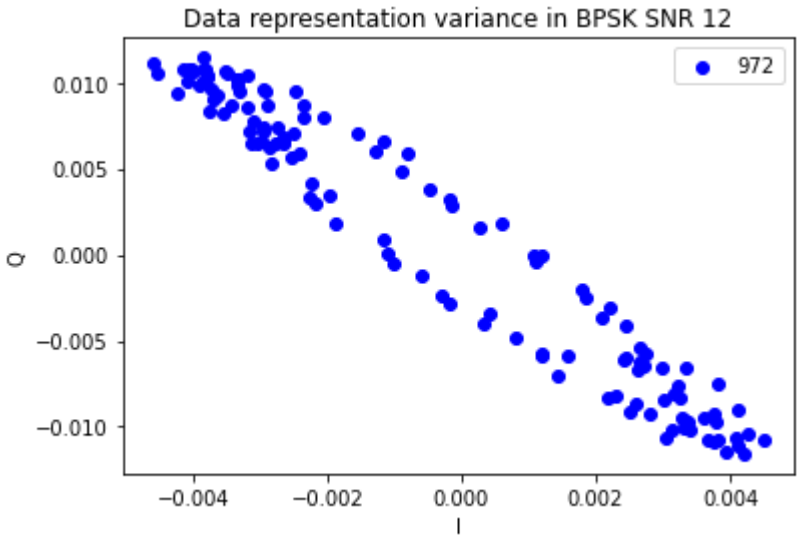
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
972
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0.000
−0.005
−0.010
Q
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−0.002
0.000
0.002
0.004
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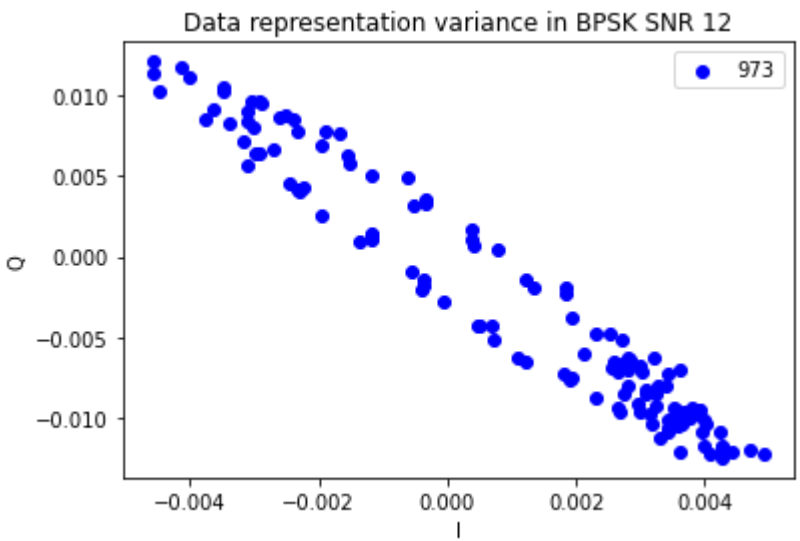
Data representation variance in BPSK SNR 12
973
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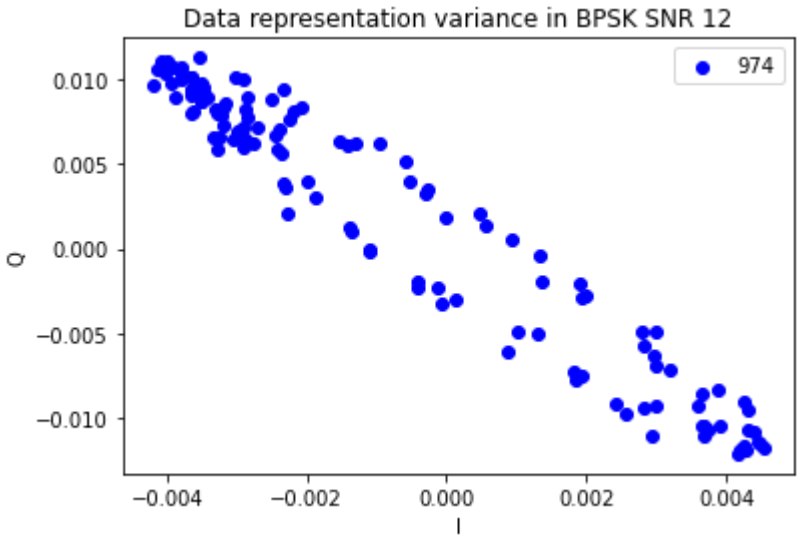
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
974
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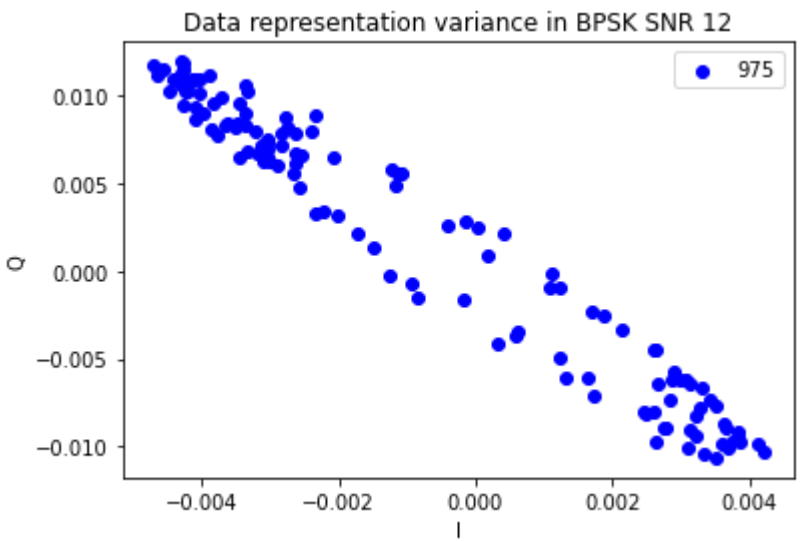
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
975
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0.005
0.000
−0.005
−0.010
Q
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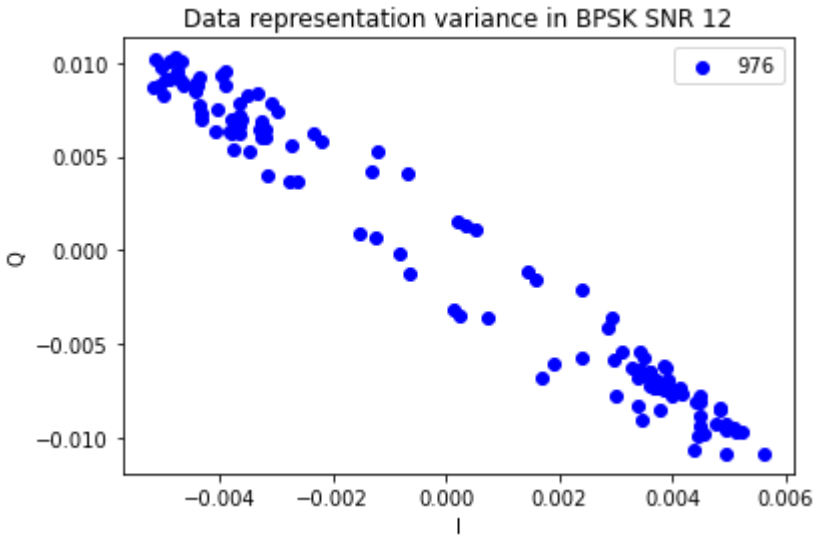
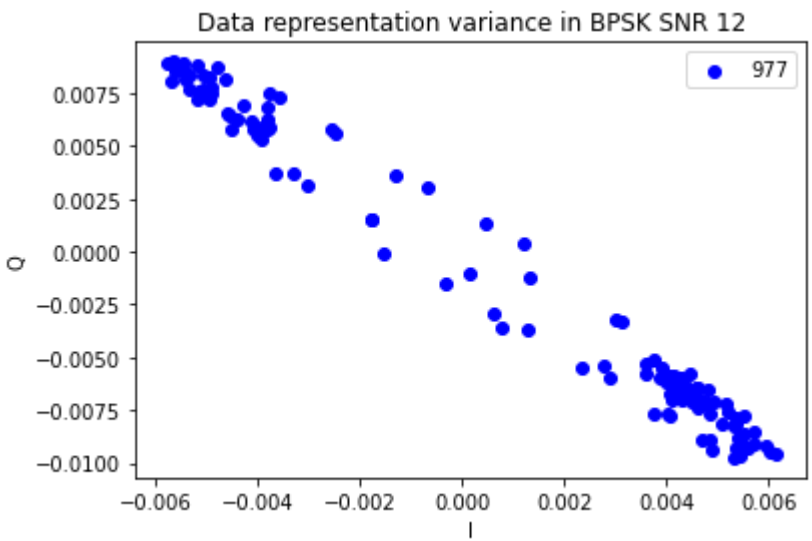
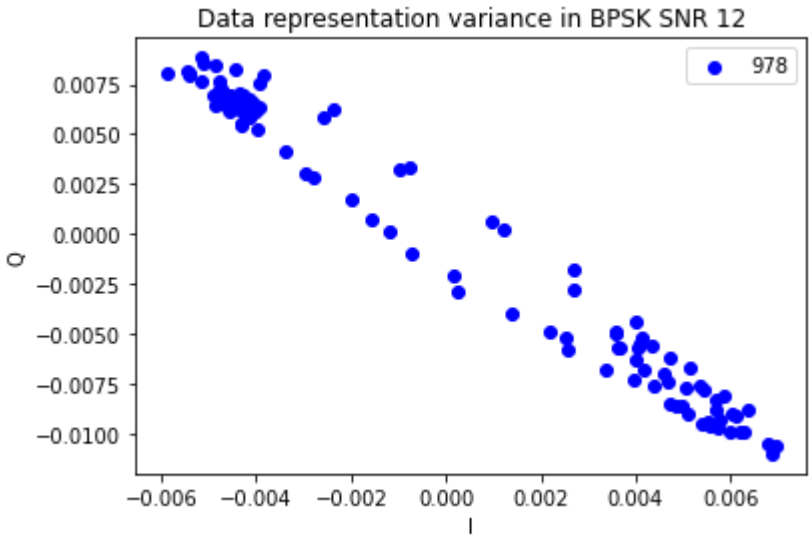
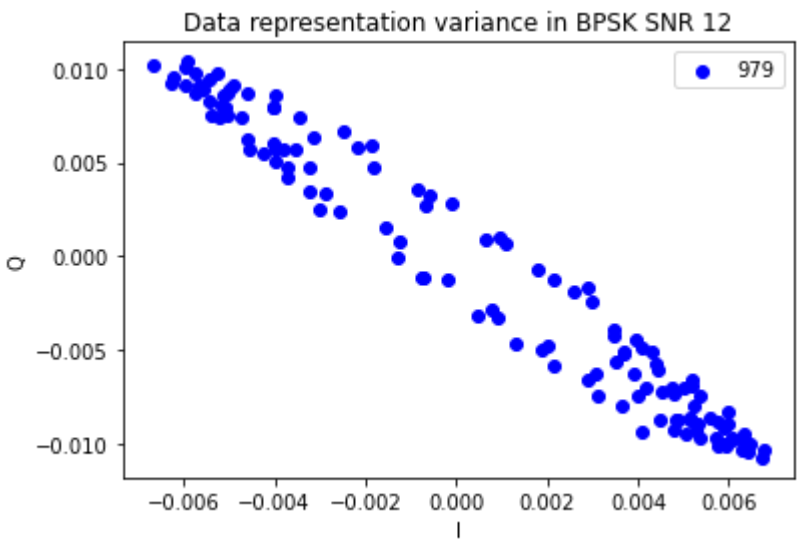
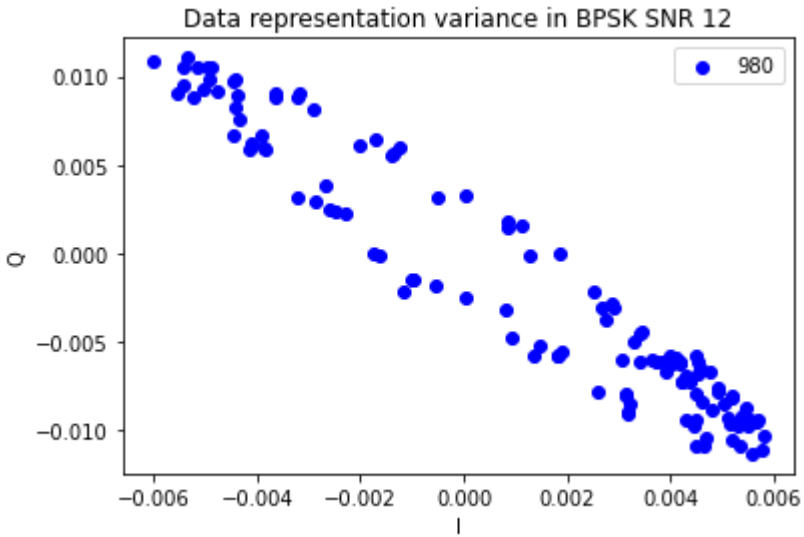
−0.002
0.000
0.002
0.004
I

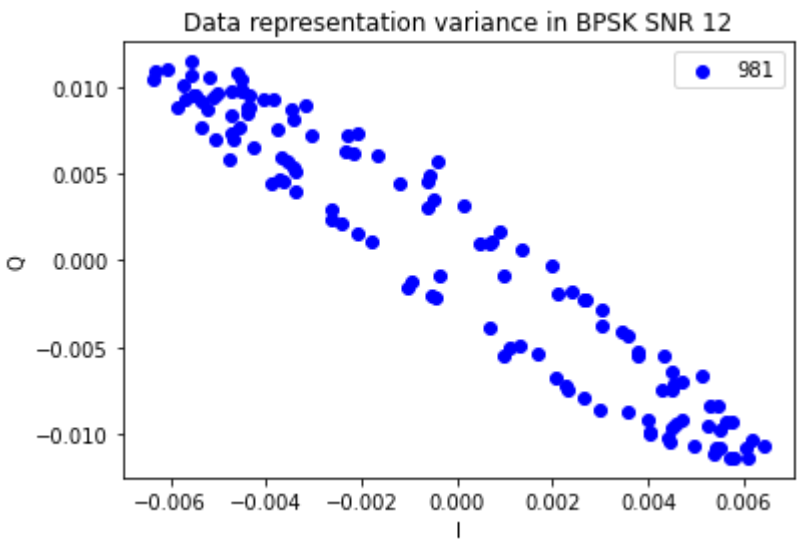

Data representation variance in BPSK SNR 12
976
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
0.006
I

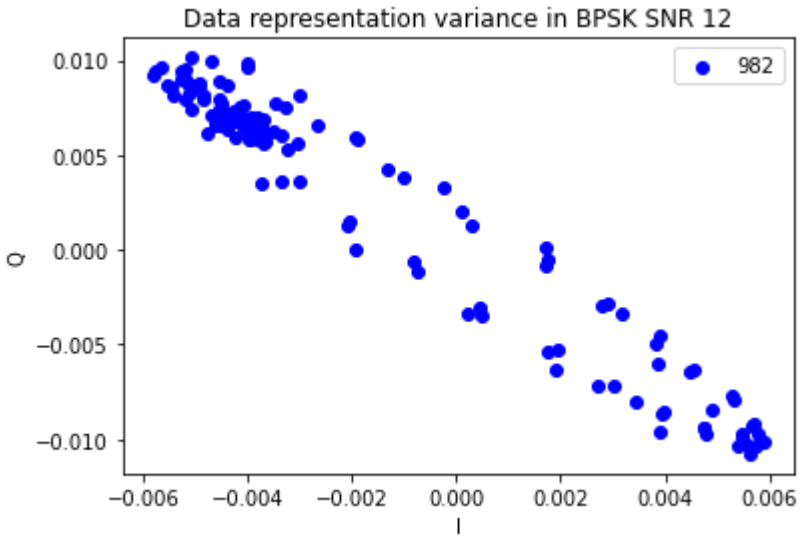

Data representation variance in BPSK SNR 12
977
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

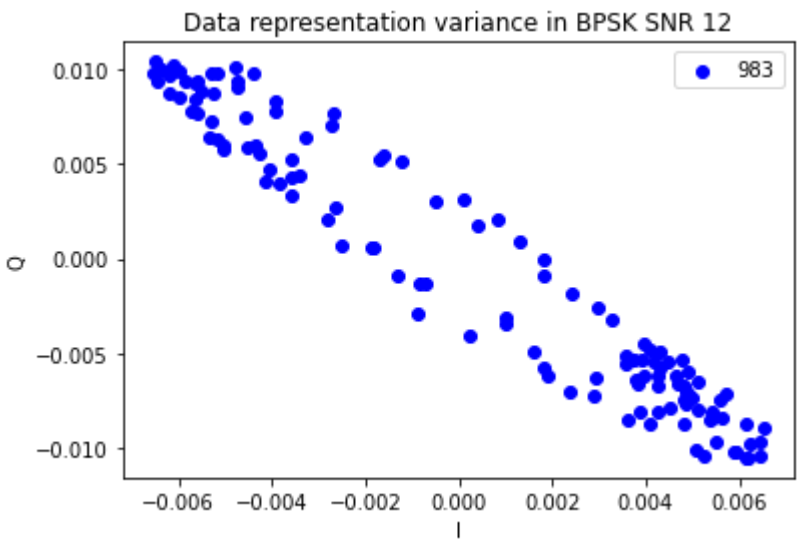

Data representation variance in BPSK SNR 12
978
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

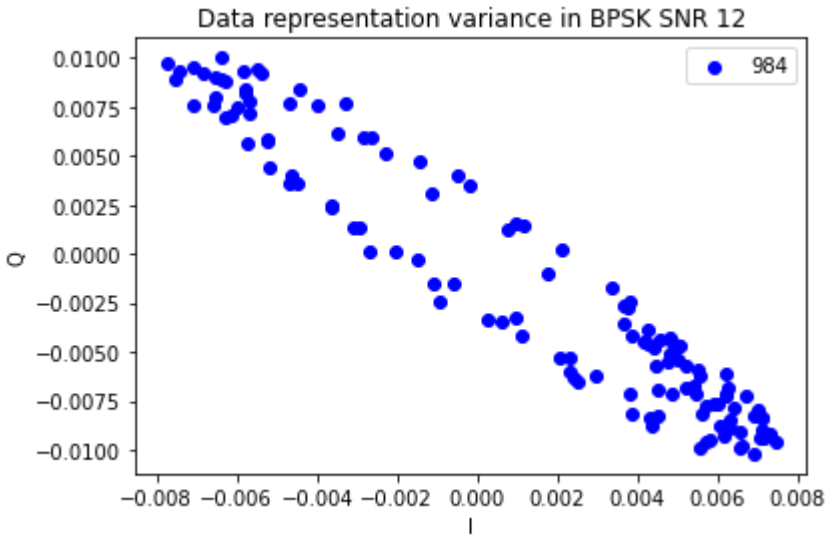

Data representation variance in BPSK SNR 12
979
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
980
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
981
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
982
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
983
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
984
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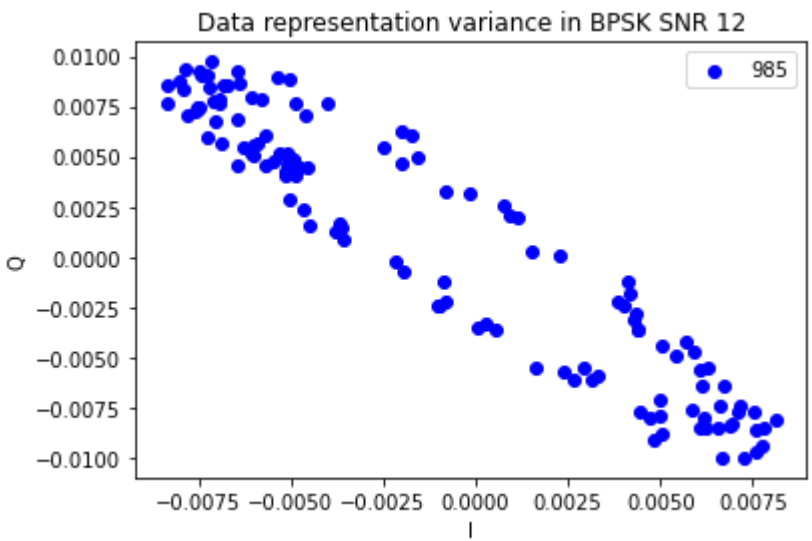
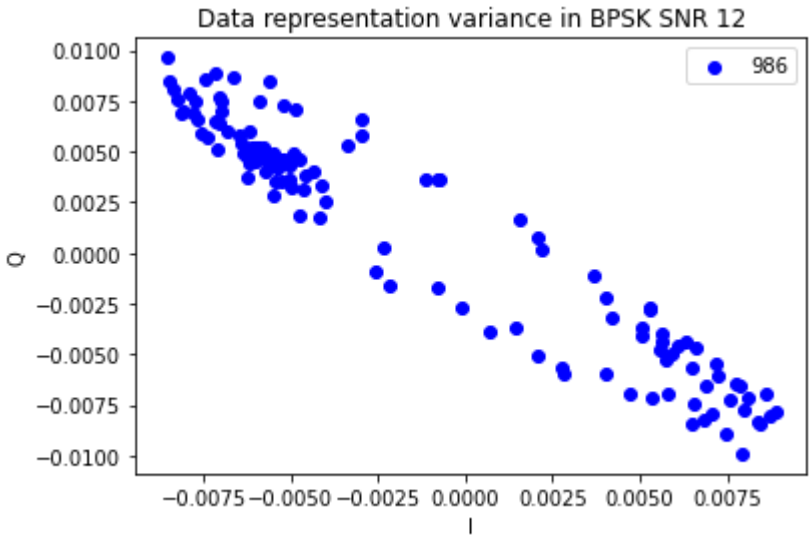
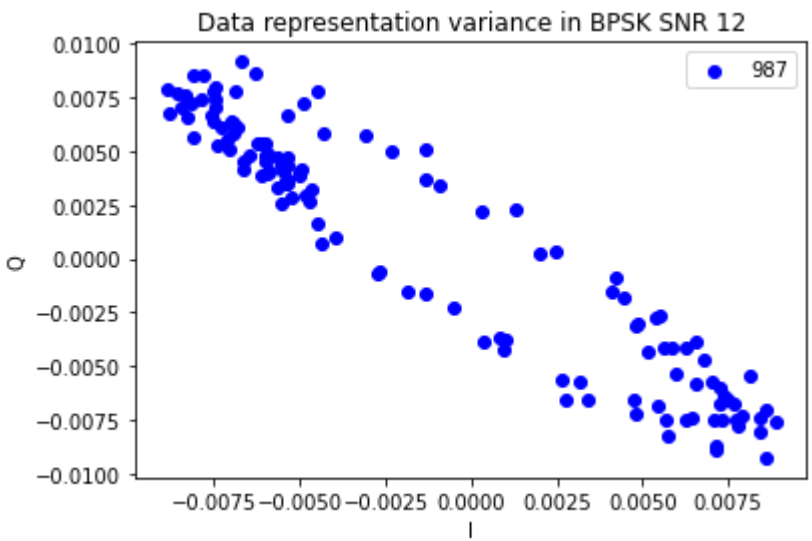
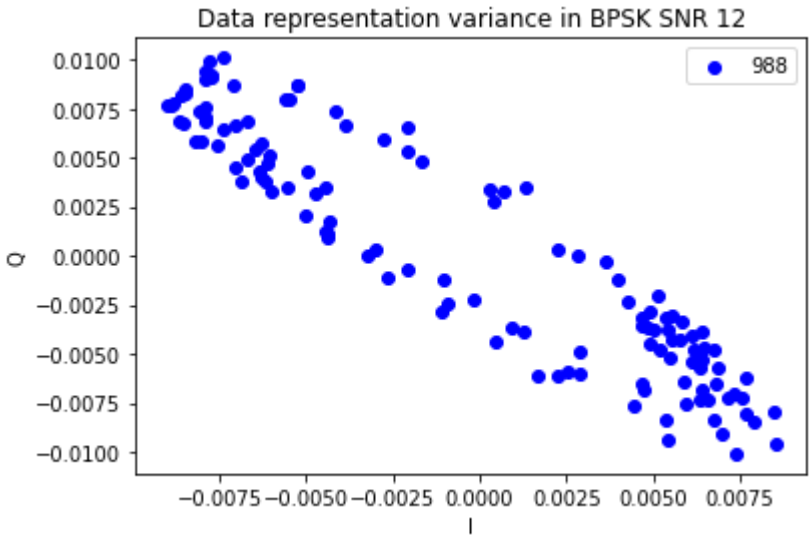
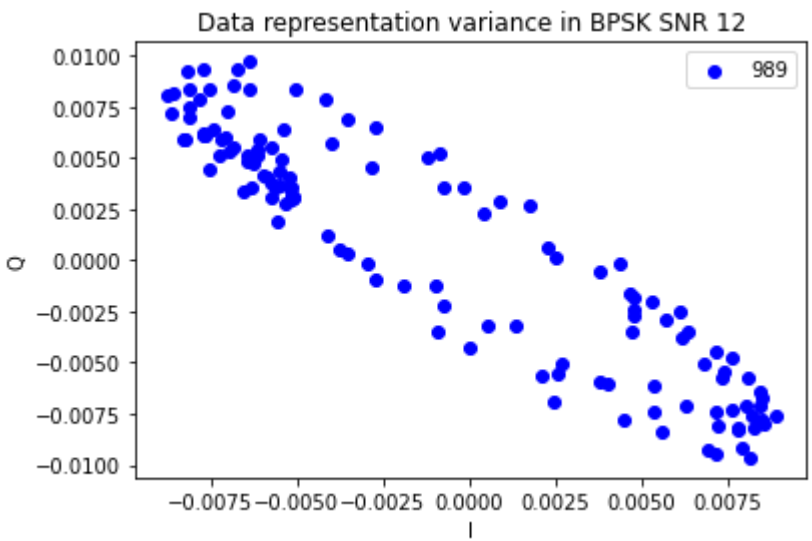
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

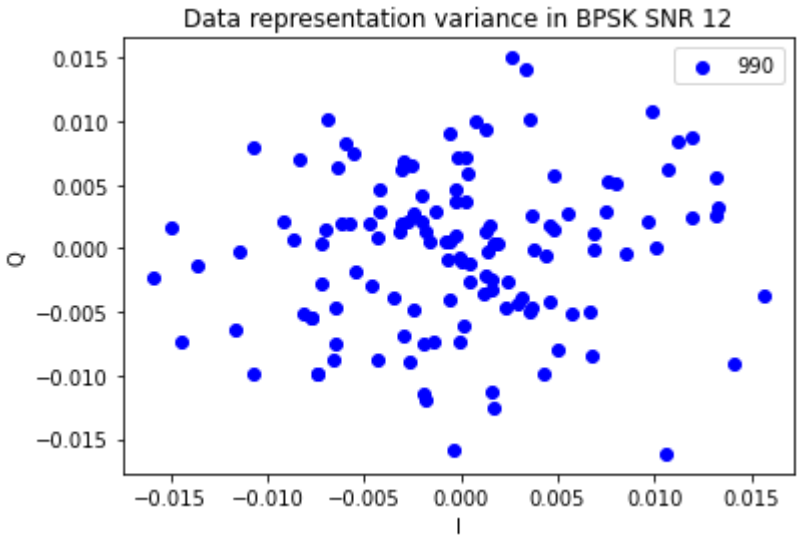

Data representation variance in BPSK SNR 12
985
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

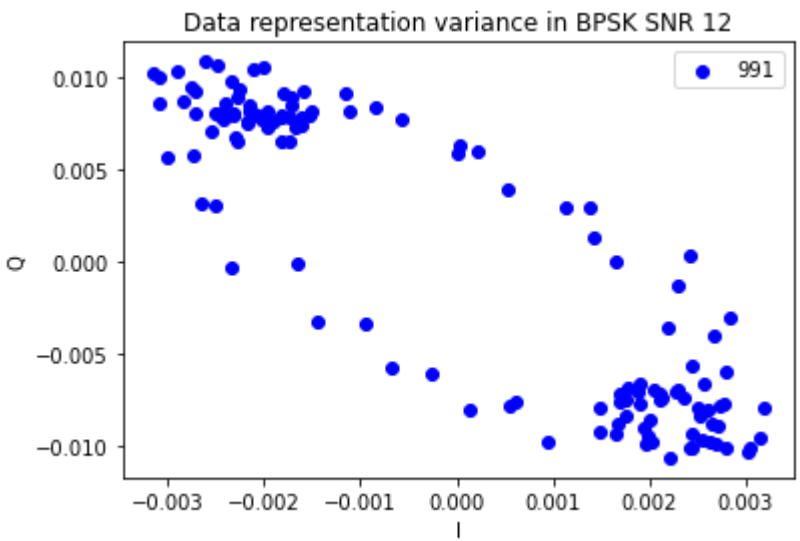

Data representation variance in BPSK SNR 12
986
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

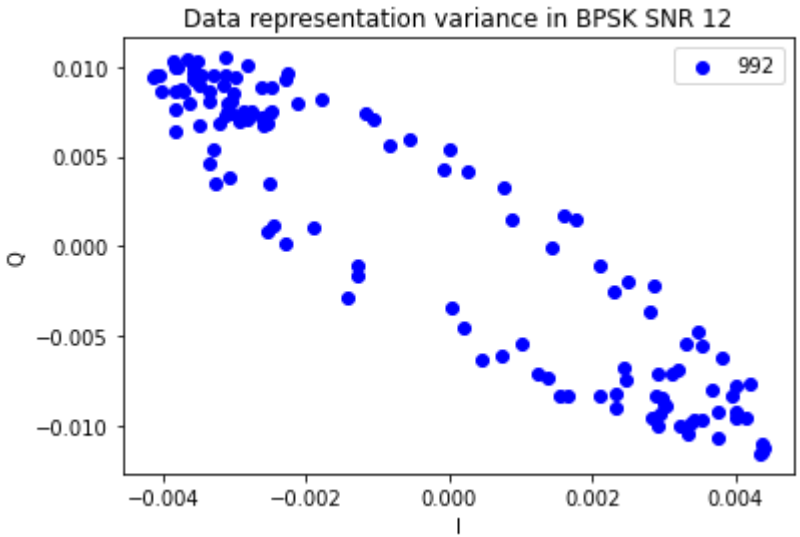

Data representation variance in BPSK SNR 12
987
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

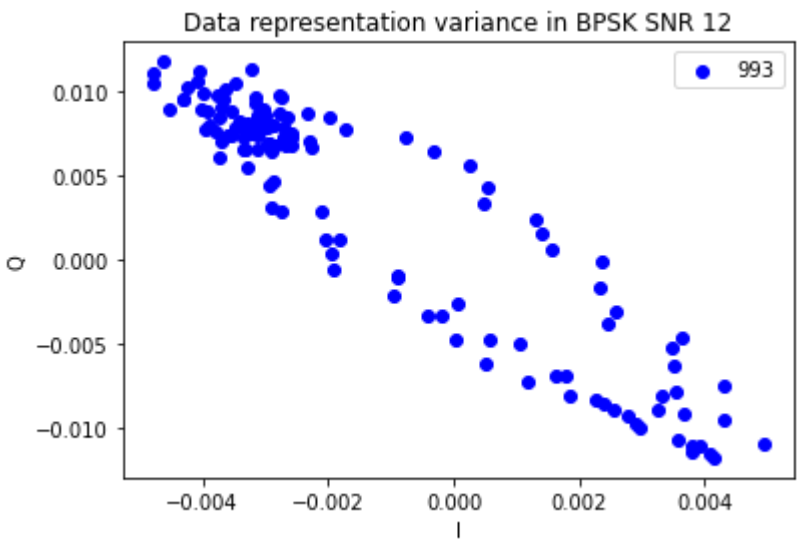

Data representation variance in BPSK SNR 12
988
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

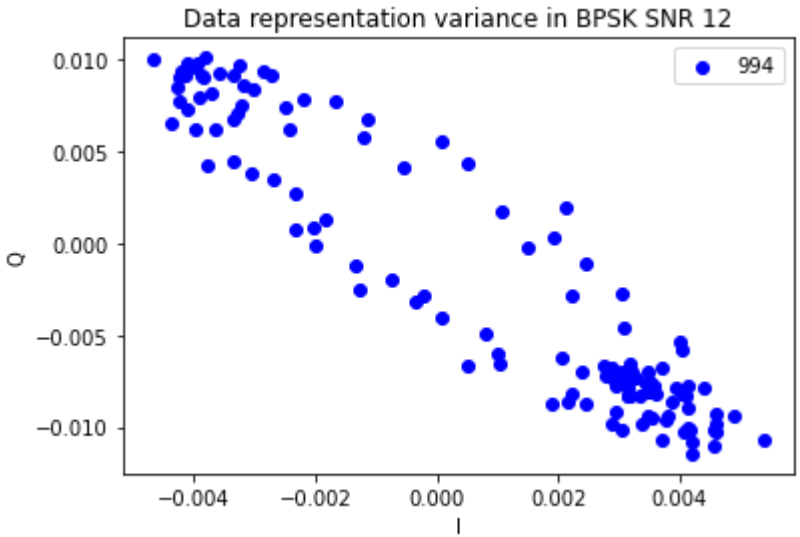

Data representation variance in BPSK SNR 12
989
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

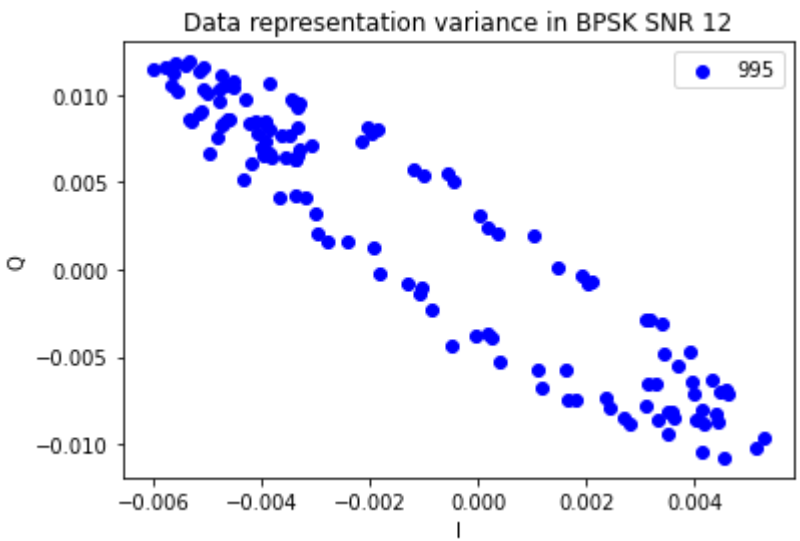

Data representation variance in BPSK SNR 12
990
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015
Q
−0.015
−0.010
−0.005
0.000
0.005
0.010
0.015
I

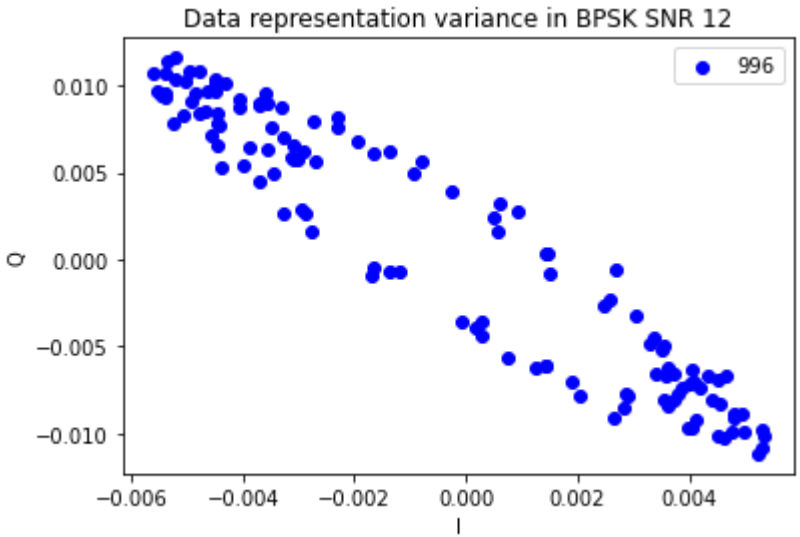

Data representation variance in BPSK SNR 12
991
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

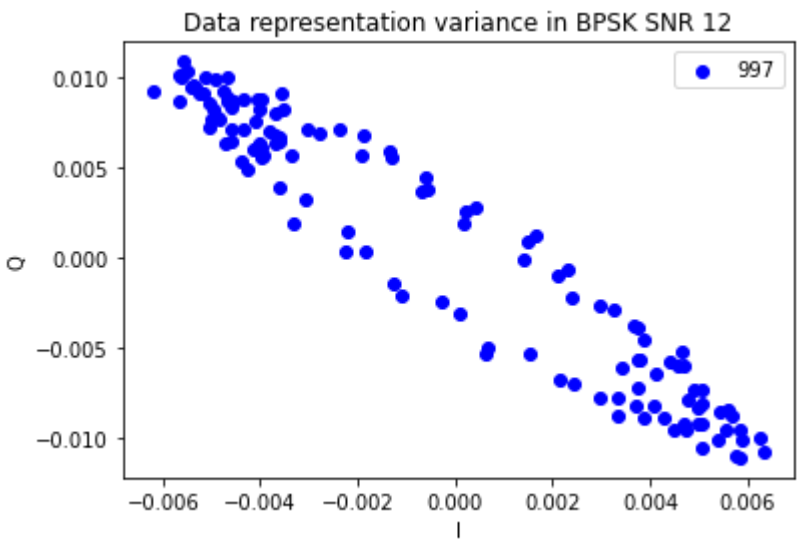

Data representation variance in BPSK SNR 12
992
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

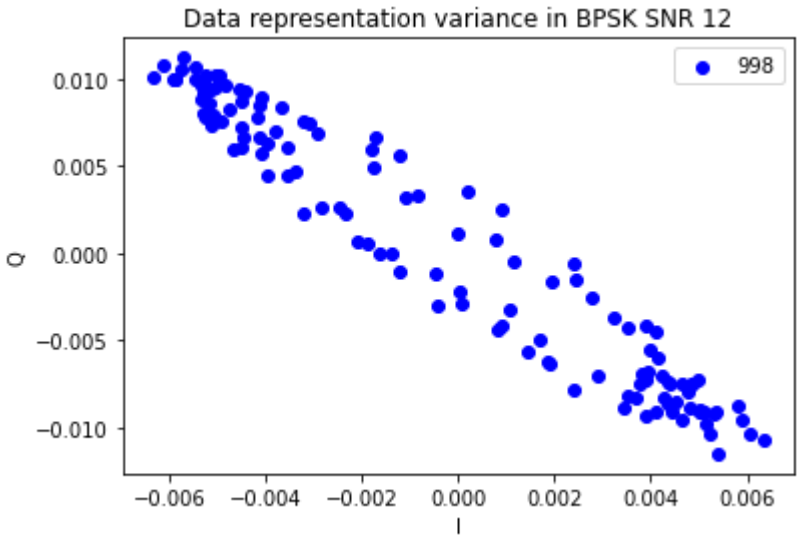

Data representation variance in BPSK SNR 12
993
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

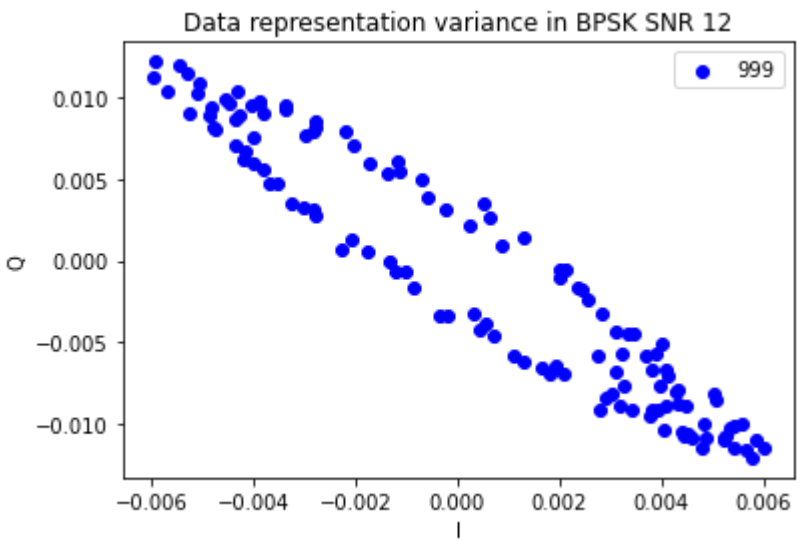

Data representation variance in BPSK SNR 12
994
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
995
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
996
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I


Data representation variance in BPSK SNR 12
997
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
998
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I


Data representation variance in BPSK SNR 12
999
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

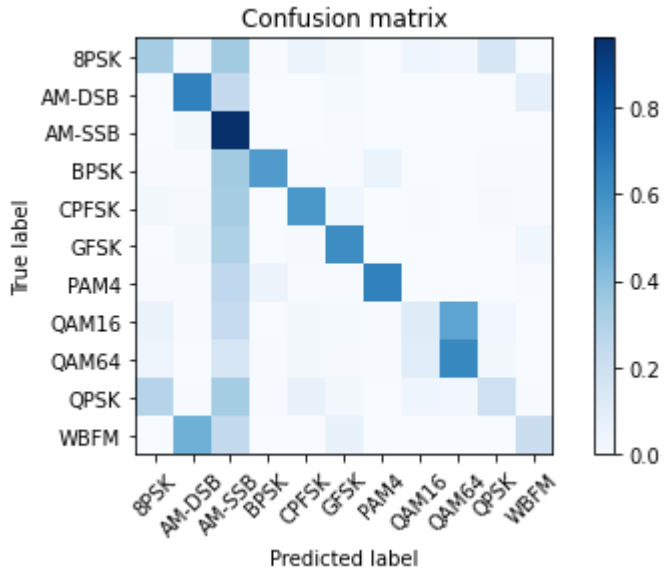
In [ ]:

In [ ]:
```
score = model.evaluate(X_test, Y_test, verbose=1, batch_size=batch_size)
print(score)
```

```
IOPub data rate exceeded.
The notebook server will temporarily stop sending output
to the client in order to avoid crashing it.
To change this limit, set the config variable
`--NotebookApp.iopub_data_rate_limit`.

Current values:
NotebookApp.iopub_data_rate_limit=1000000.0 (bytes/sec)
NotebookApp.rate_limit_window=3.0 (secs)


1.299043229380521
```

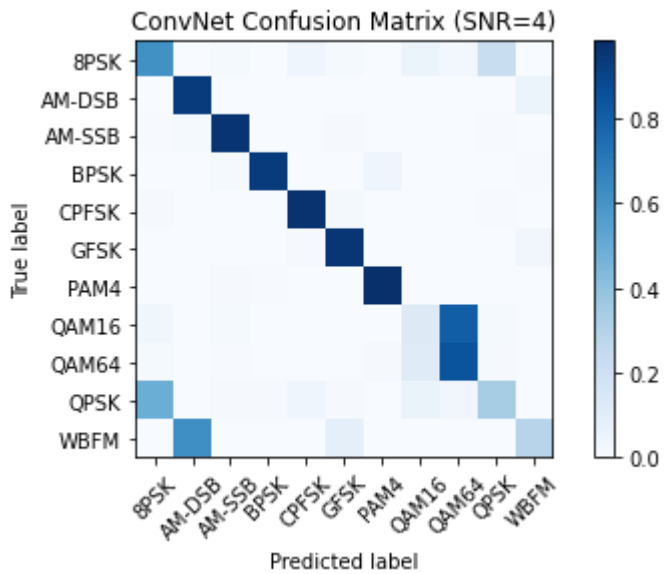
In [ ]:
```
def plot_confusion_matrix(cm, title='Confusion matrix', cmap=plt.cm.Blues, labels=[]):
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()
    tick_marks = np.arange(len(labels))
    plt.xticks(tick_marks, labels, rotation=45)
    plt.yticks(tick_marks, labels)
    plt.tight_layout()
    plt.ylabel('True label')
    plt.xlabel('Predicted label')
```

In [ ]:
```
test_Y_hat = model.predict(X_test, batch_size=batch_size)
conf = np.zeros([len(classes),len(classes)])
confnorm = np.zeros([len(classes),len(classes)])
for i in range(0,X_test.shape[0]):
    j = list(Y_test[i,:]).index(1)
    k = int(np.argmax(test_Y_hat[i,:]))
    conf[j,k] = conf[j,k] + 1
for i in range(0,len(classes)):
    confnorm[i,:] = conf[i,:] / np.sum(conf[i,:])
plot_confusion_matrix(confnorm, labels=classes)
```



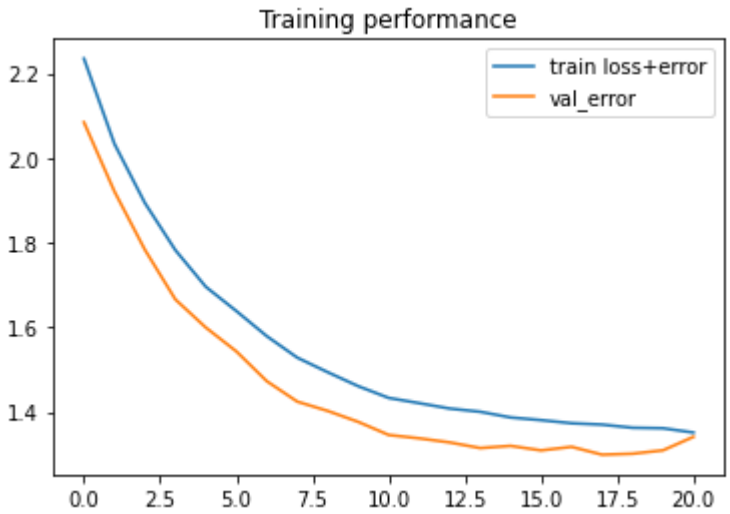
In [ ]:
```
# Plot confusion matrix
acc = {}
for snr in snrs:

    # extract classes @ SNR
    test_SNRs = list(map(lambda x: lbl[x][1], test_idx))
    test_X_i = X_test[np.where(np.array(test_SNRs)==snr)]
    test_Y_i = Y_test[np.where(np.array(test_SNRs)==snr)]

    # estimate classes
    test_Y_i_hat = model.predict(test_X_i)
    conf = np.zeros([len(classes),len(classes)])
    confnorm = np.zeros([len(classes),len(classes)])
    for i in range(0,test_X_i.shape[0]):               j
        j = list(test_Y_i[i,:]).index(1)
        k = int(np.argmax(test_Y_i_hat[i,:]))
        conf[j,k] = conf[j,k] + 1
    for i in range(0,len(classes)):
        confnorm[i,:] = conf[i,:] / np.sum(conf[i,:])

    if snr==4:
      plt.figure()
      plot_confusion_matrix(confnorm, labels=classes, title="ConvNet Confusion Matrix (SNR=%d)"%(snr))

    cor = np.sum(np.diag(conf))
    ncor = np.sum(conf) - cor
    print("Overall Accuracy: ", cor / (cor+ncor))
    acc[snr] = 1.0*cor/(cor+ncor)
```

```
Overall Accuracy:  0.09460201280878316
Overall Accuracy:  0.09355131698455948
Overall Accuracy:  0.0956946454413893
Overall Accuracy:  0.1057380007217611
Overall Accuracy:  0.1422060164083865
Overall Accuracy:  0.22534210058645815
Overall Accuracy:  0.34135586992467387
Overall Accuracy:  0.4798387096774194
Overall Accuracy:  0.5950092421441775
Overall Accuracy:  0.6507619738751814
Overall Accuracy:  0.7016423357664233
Overall Accuracy:  0.7084696474009451
Overall Accuracy:  0.7268722466960352
Overall Accuracy:  0.7287003610108304
Overall Accuracy:  0.7238954012623986
Overall Accuracy:  0.7255009107468123
Overall Accuracy:  0.7157342024262177
Overall Accuracy:  0.7158147259642
Overall Accuracy:  0.7134841628959276
Overall Accuracy:  0.7186318631863187
```



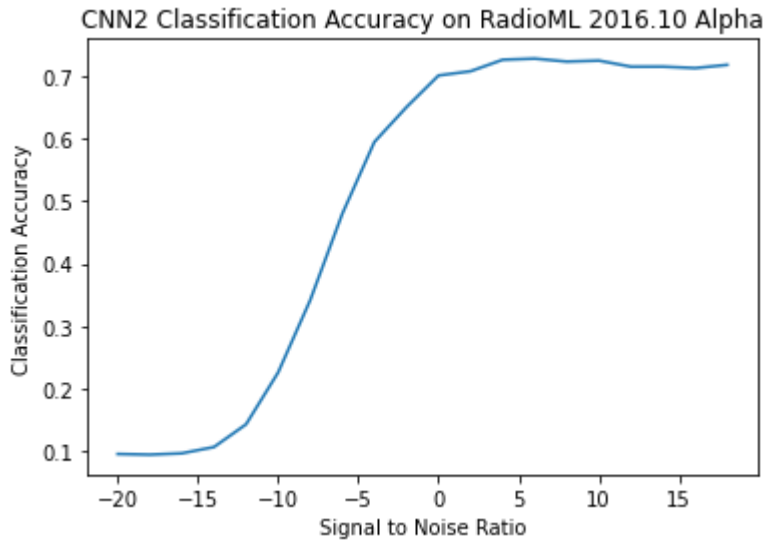
In [ ]:
```
# Show loss curves
plt.figure()
plt.title('Training performance')
plt.plot(history.epoch, history.history['loss'], label='train loss+error')
plt.plot(history.epoch, history.history['val_loss'], label='val_error')
plt.legend()
```

Out[ ]:
```
<matplotlib.legend.Legend at 0x7fc293653cf8>
```



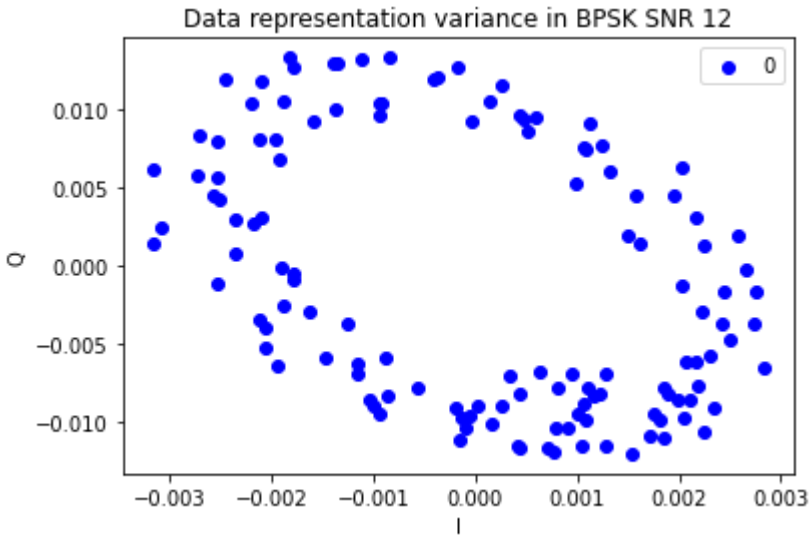
In [ ]:
```
# Plot accuracy curve
plt.plot(snrs, list(map(lambda x: acc[x], snrs)))
plt.xlabel("Signal to Noise Ratio")
plt.ylabel("Classification Accuracy")
plt.title("CNN2 Classification Accuracy on RadioML 2016.10 Alpha")
```

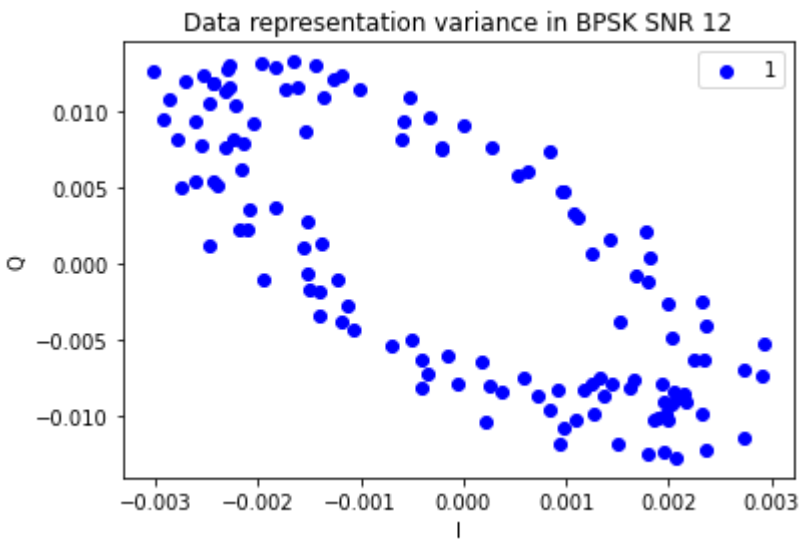
Out[ ]:
```
Text(0.5, 1.0, 'CNN2 Classification Accuracy on RadioML 2016.10 Alpha')
```

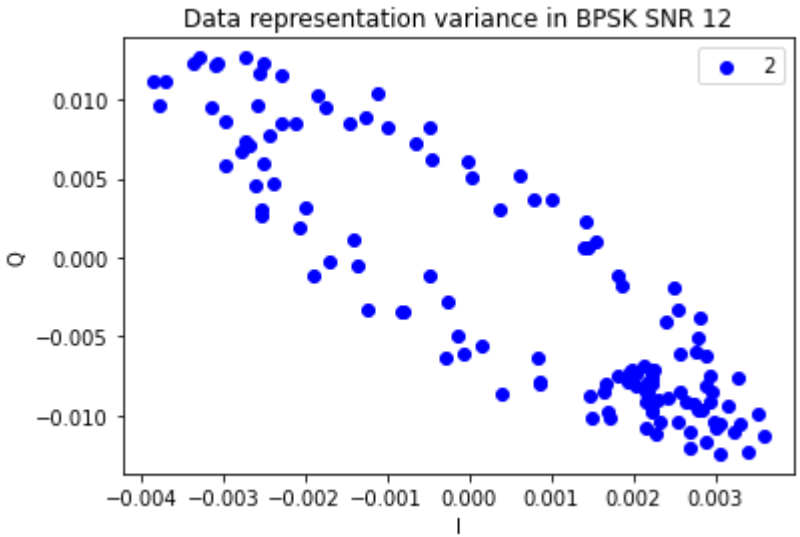


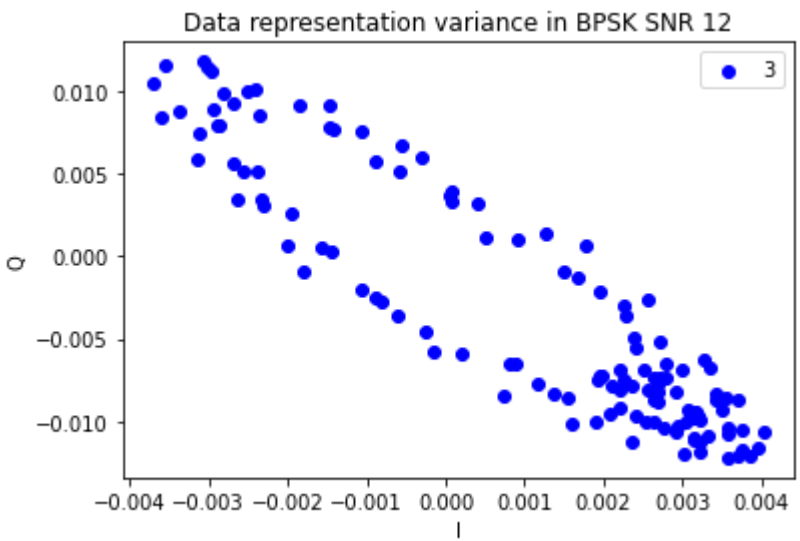
In [ ]:
```
import pickle
import random, sys, keras
import pandas as pd
import numpy as np

with open('My Drive/Colab Notebooks/MOD.pkl', 'rb') as open_file:
        u = pickle._Unpickler( open_file )
        u.encoding = 'latin1'
        Xd = u.load()
snrs,mods = map(lambda j: sorted(list(set(map(lambda x: x[j], Xd.keys())))), [1,0])
X = []
Y=[]
lbl = []
for mod in mods:
  for snr in snrs:
    if(mod=='BPSK'and snr==12):
      test = Xd[(mod,snr)]
      #print(test)
      X.append(Xd[(mod,snr)])
      for i in range(Xd[(mod,snr)].shape[0]):
        lbl.append((mod,snr))
        Y.append([test[0]+1j*test[1]])
X = np.vstack(X)
Y= np.vstack(Y)

df= pd.DataFrame(lbl,columns=["mod","snr"])
df['snr'].value_counts()
ind = []
for i in range(0,df.shape[0]):
  if(df['snr'][i]==16):
    ind.append(i)

import matplotlib.pyplot as plt
for i in range(0,1000,1):
    x = X[i][0]
    y= X[i][1]
    fig = plt.figure()
    plt.scatter(x,y,c='blue',label=i)
    plt.xlabel("I")
    plt.ylabel("Q")
    plt.title("Data representation variance in BPSK SNR 12")
    plt.legend()
```

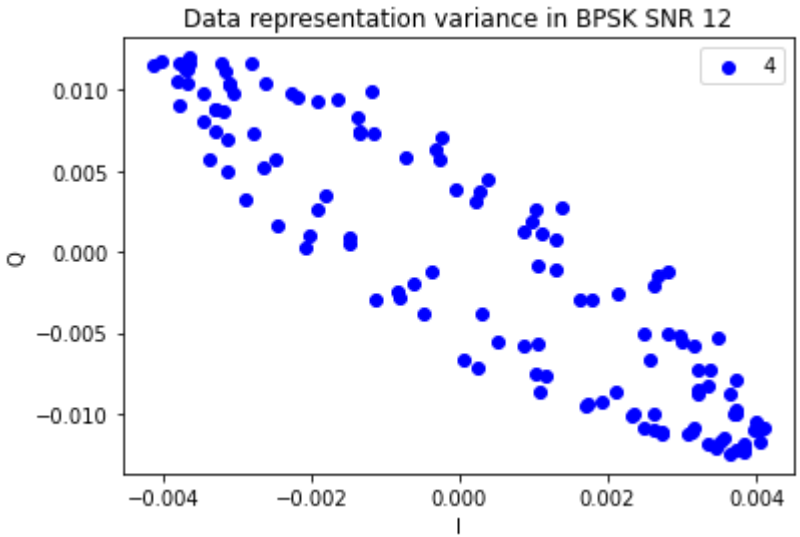
```
    plt.show()
#fig.savefig(path+"/IQ trained images/snr/%d.png"  % i)
```

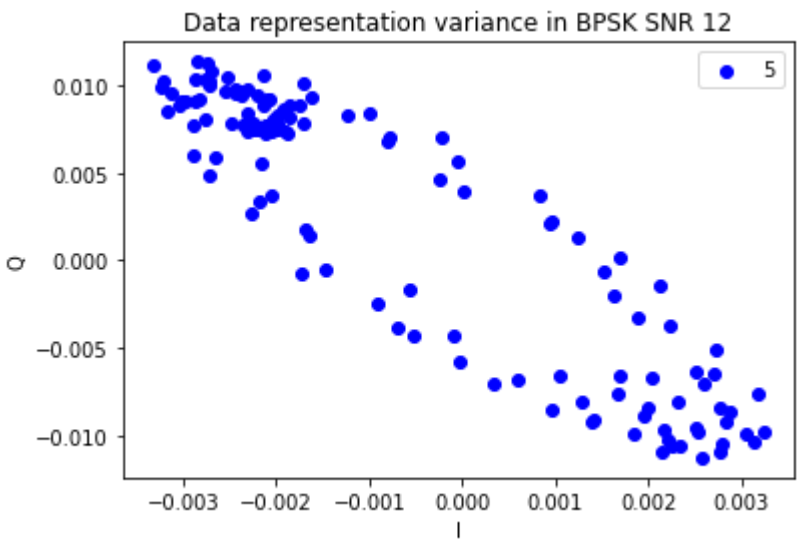

Data representation variance in BPSK SNR 12
0
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

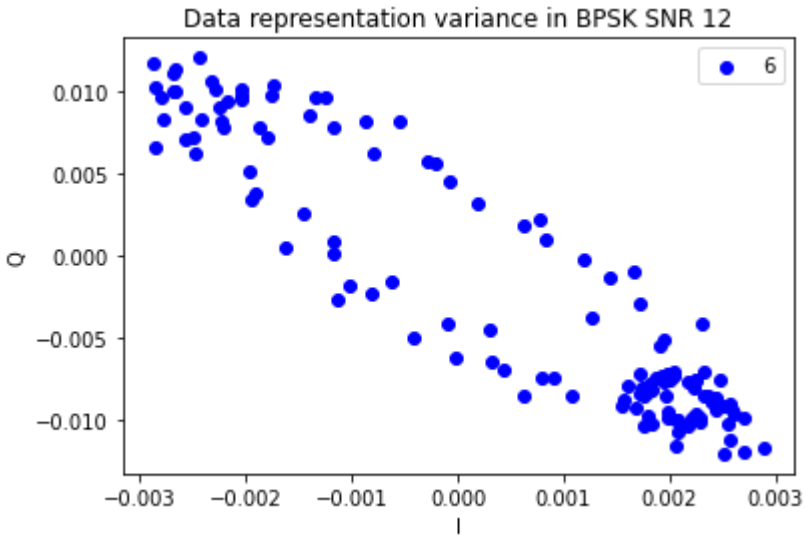

Data representation variance in BPSK SNR 12
1
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

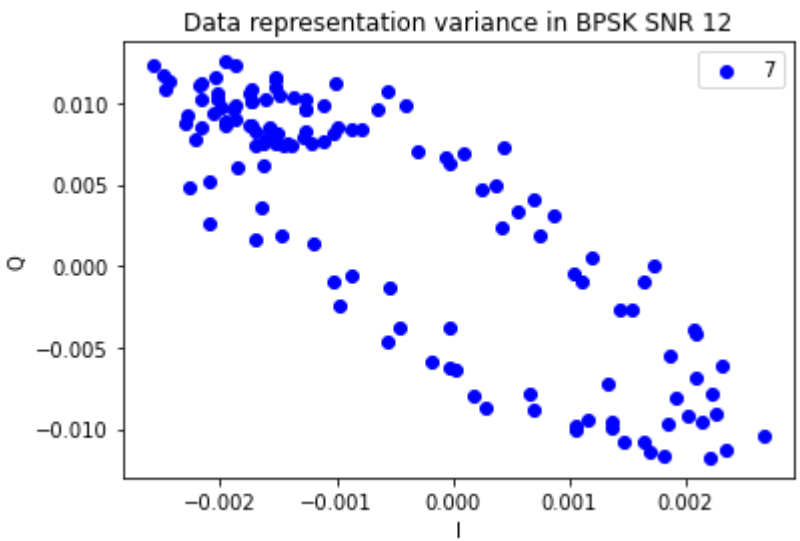

Data representation variance in BPSK SNR 12
2
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

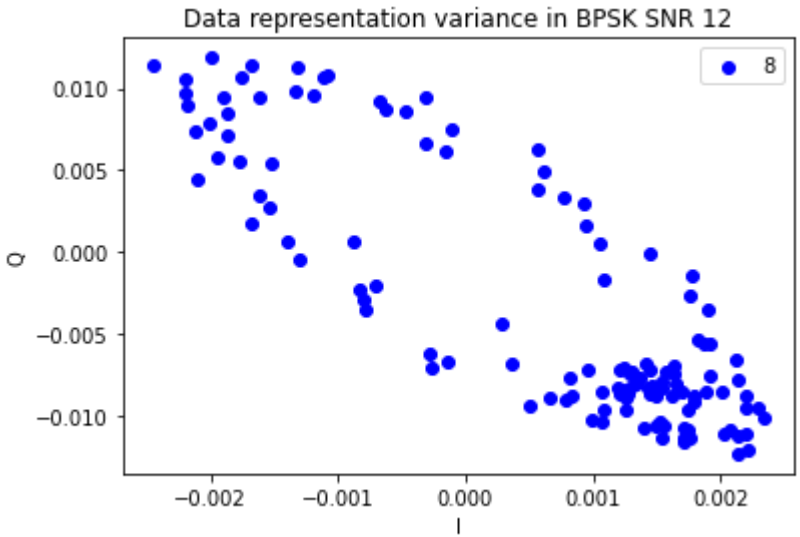

Data representation variance in BPSK SNR 12
3
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

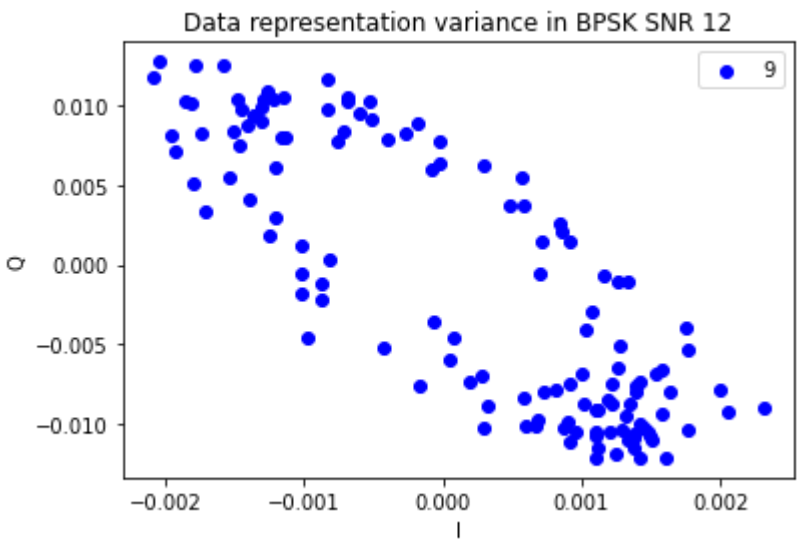

Data representation variance in BPSK SNR 12
4
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

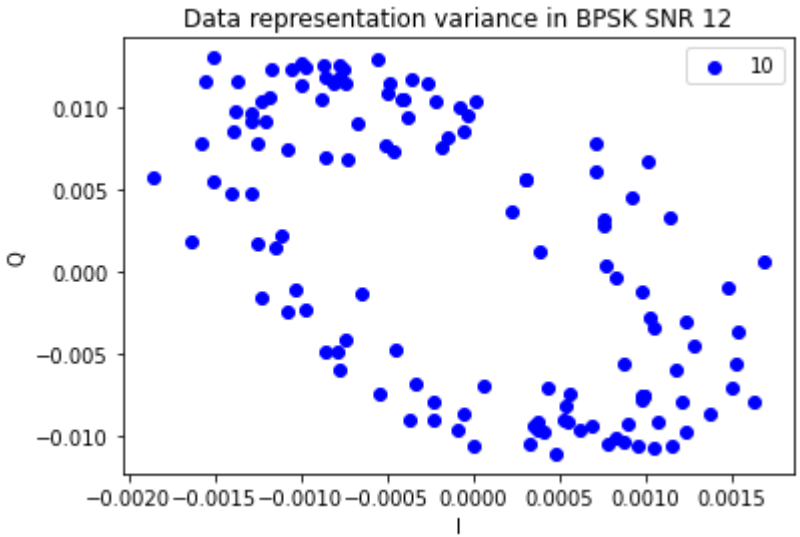

Data representation variance in BPSK SNR 12
5
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

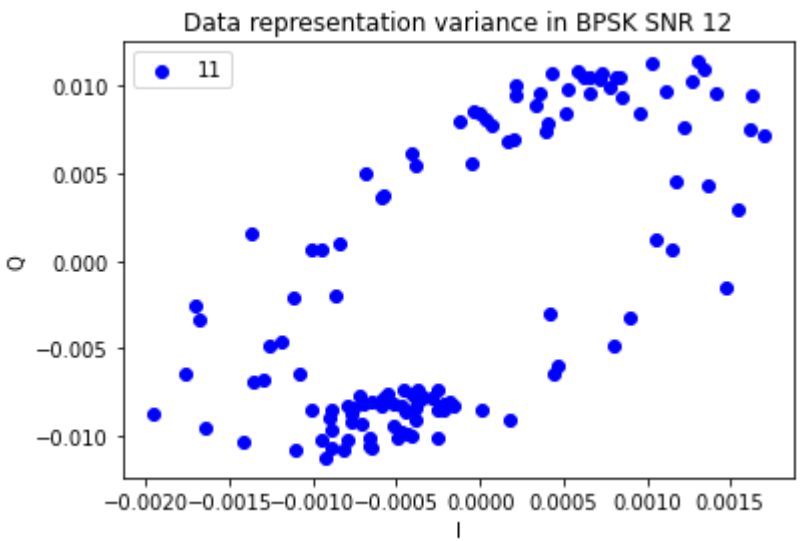

Data representation variance in BPSK SNR 12
6
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

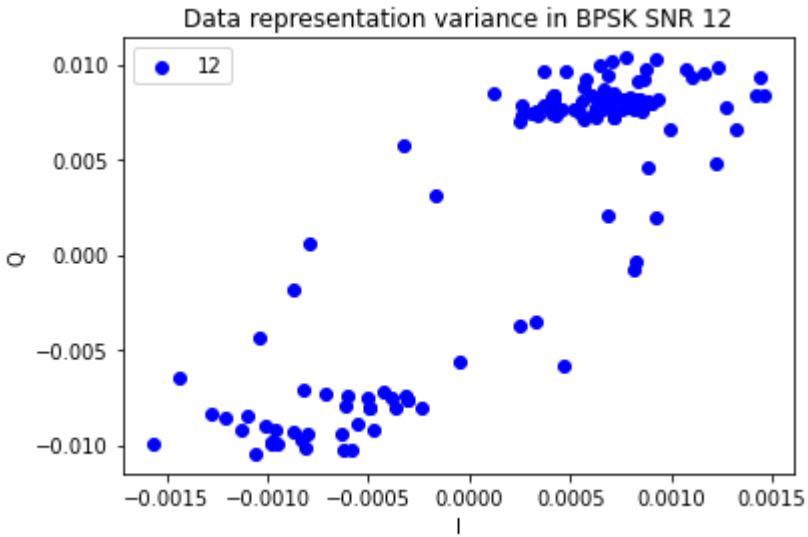

Data representation variance in BPSK SNR 12
7
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

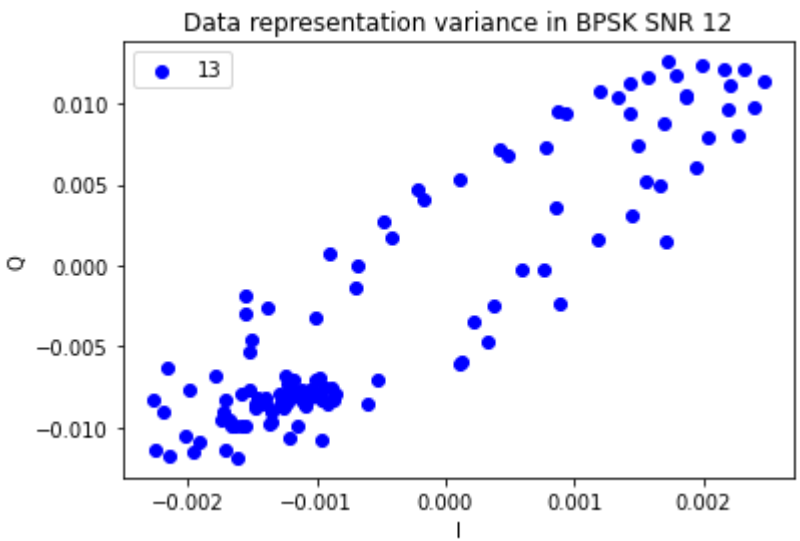

Data representation variance in BPSK SNR 12
8
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

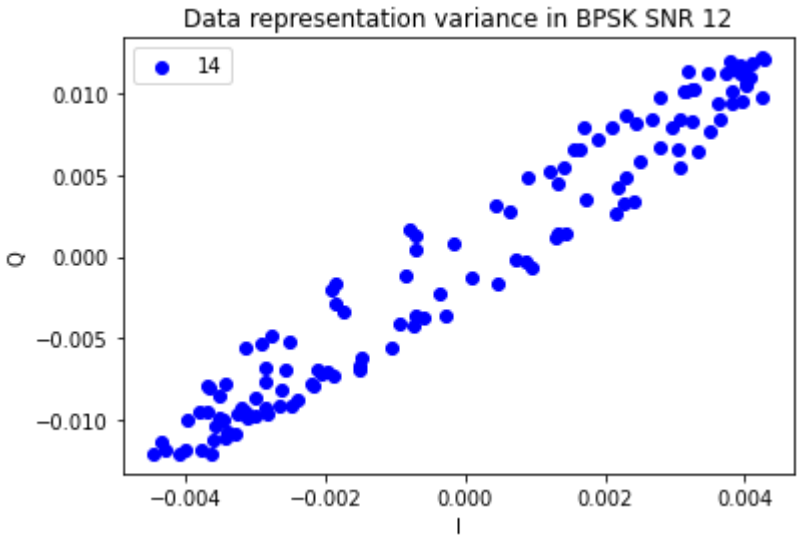

Data representation variance in BPSK SNR 12
9
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

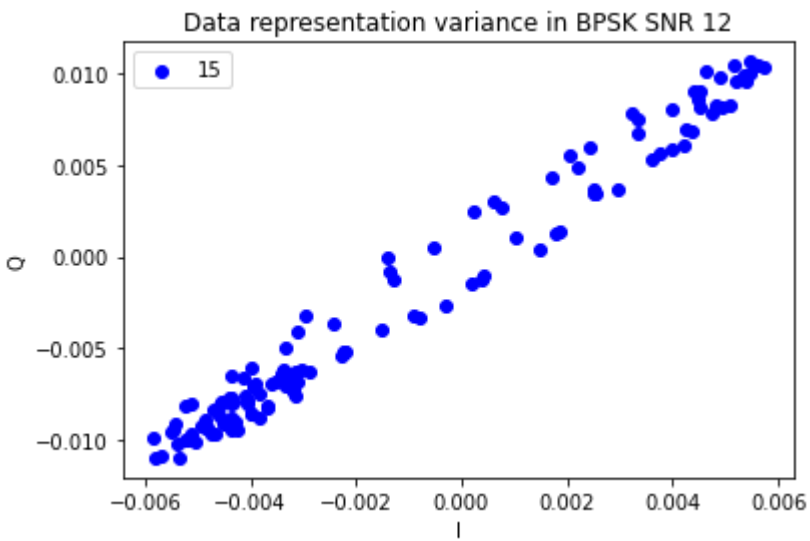

Data representation variance in BPSK SNR 12
10
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

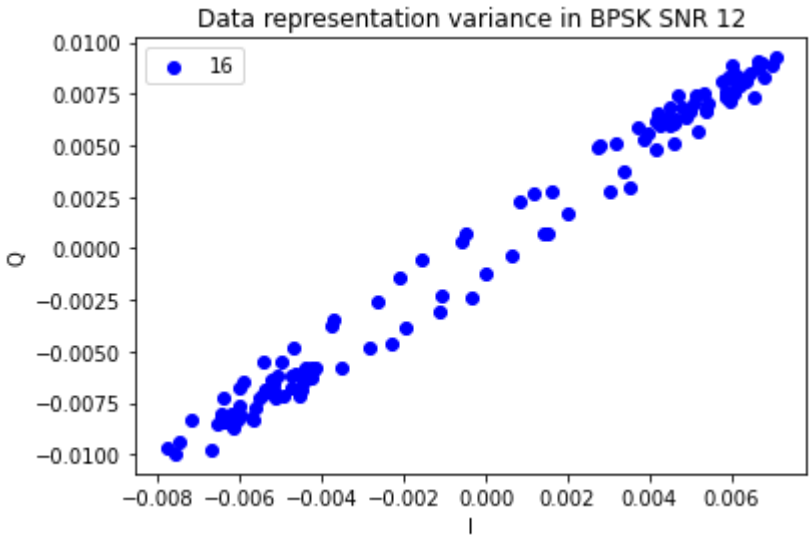

Data representation variance in BPSK SNR 12
11
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

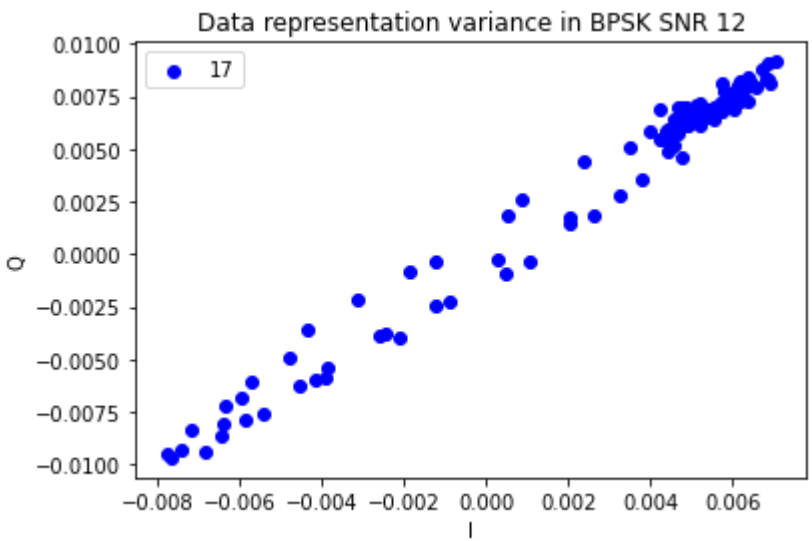

Data representation variance in BPSK SNR 12
12
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

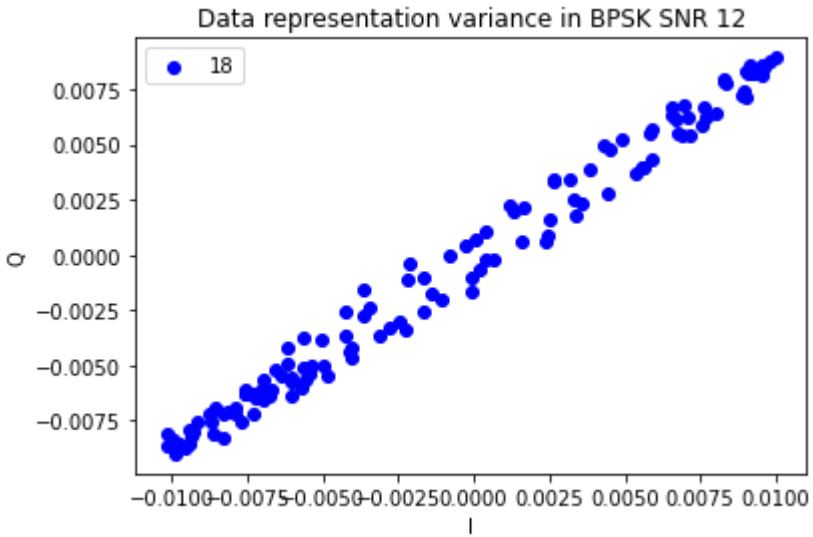

Data representation variance in BPSK SNR 12
13
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

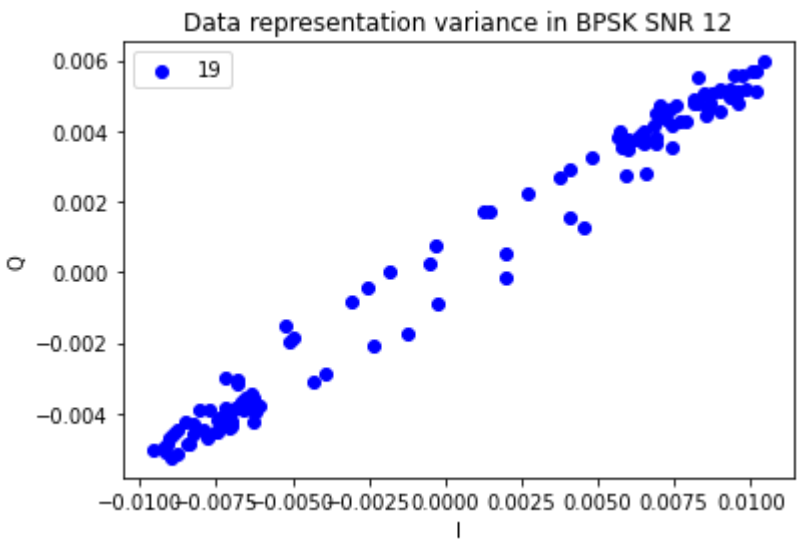

Data representation variance in BPSK SNR 12
14
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

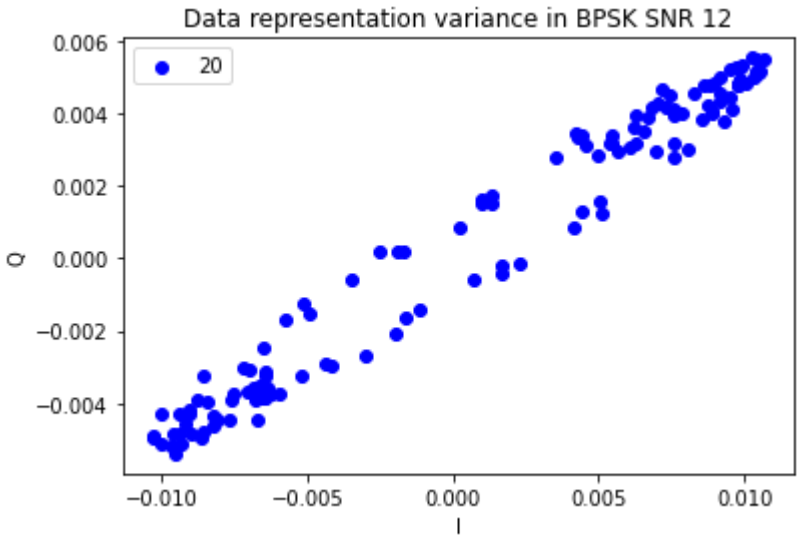

Data representation variance in BPSK SNR 12
15
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

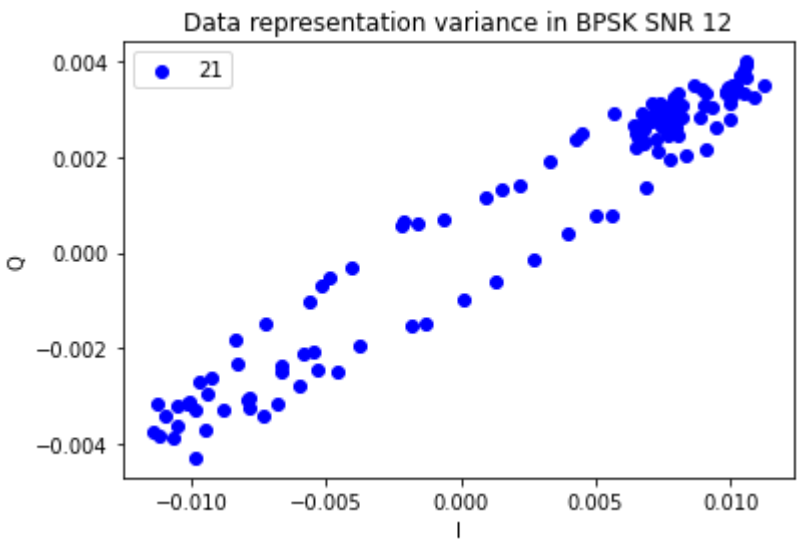

Data representation variance in BPSK SNR 12
16
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I

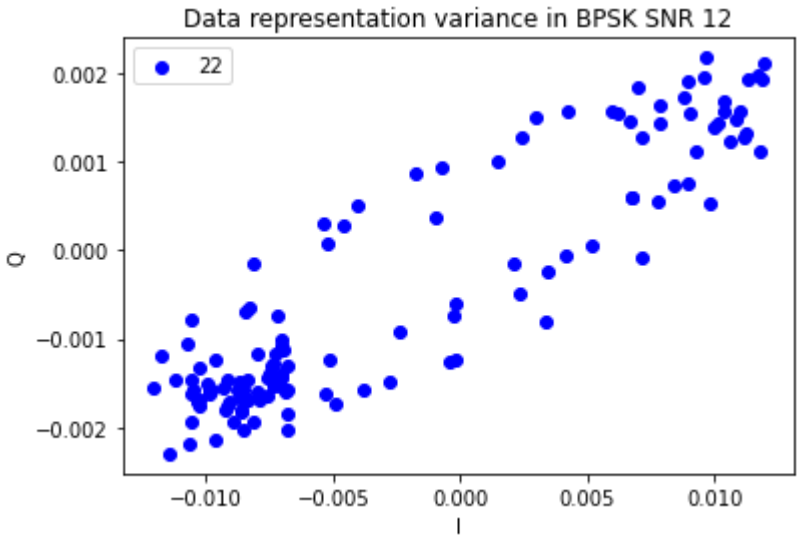

Data representation variance in BPSK SNR 12
17
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I

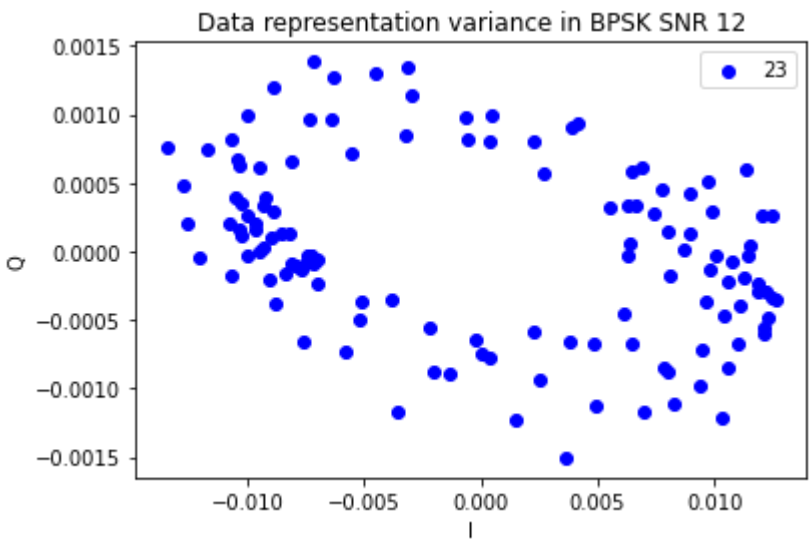

Data representation variance in BPSK SNR 12
18
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

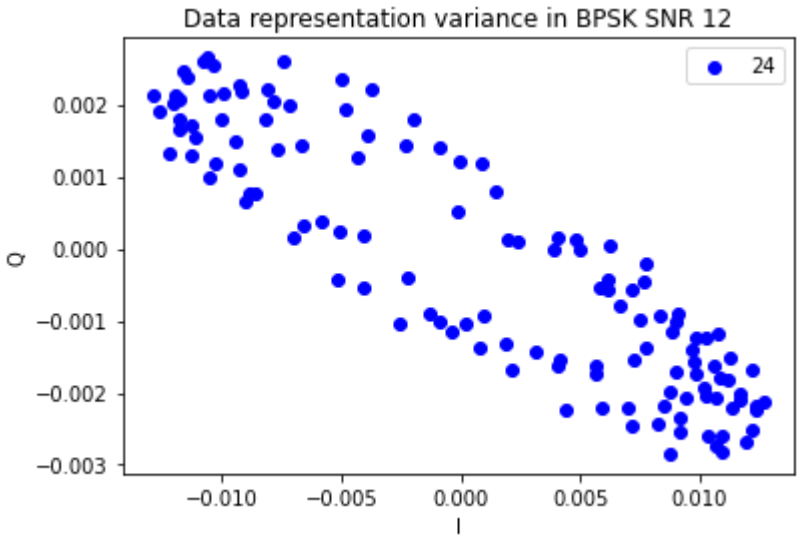

Data representation variance in BPSK SNR 12
19
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

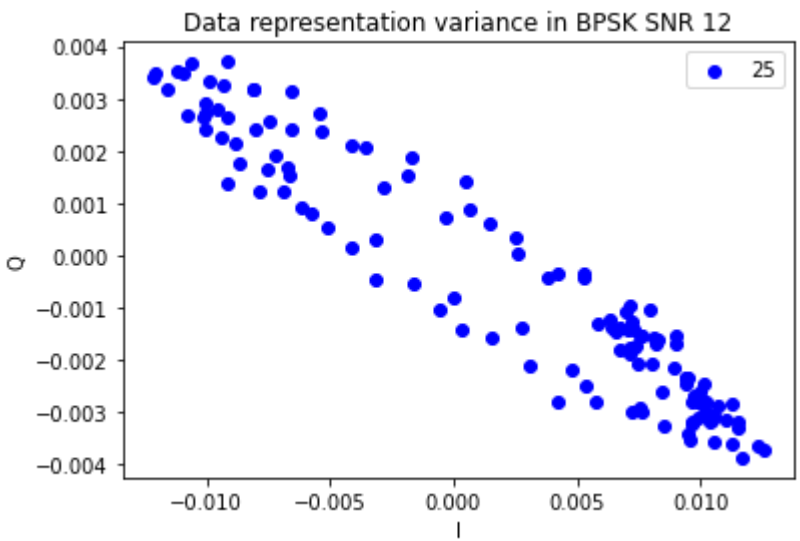

Data representation variance in BPSK SNR 12
20
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

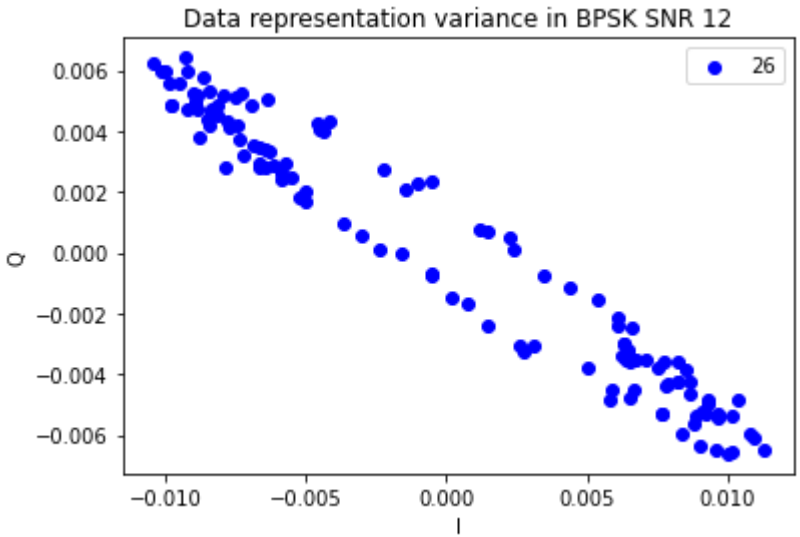

Data representation variance in BPSK SNR 12
21
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

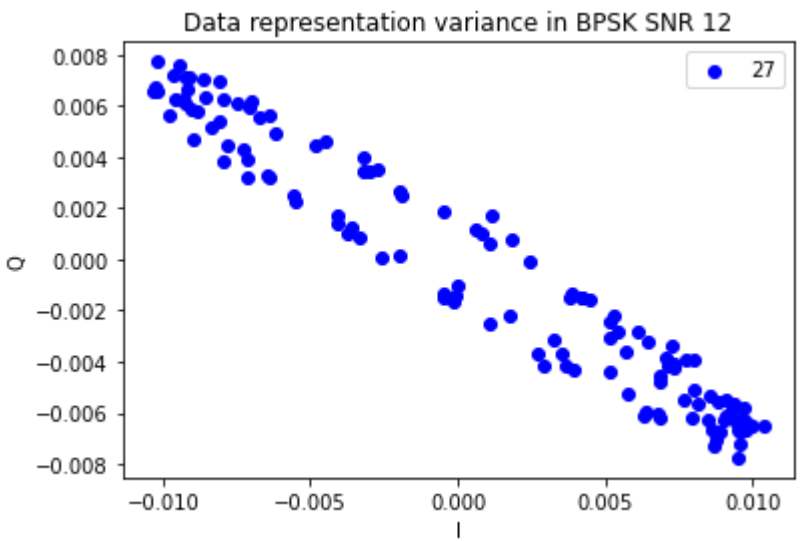

Data representation variance in BPSK SNR 12
22
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

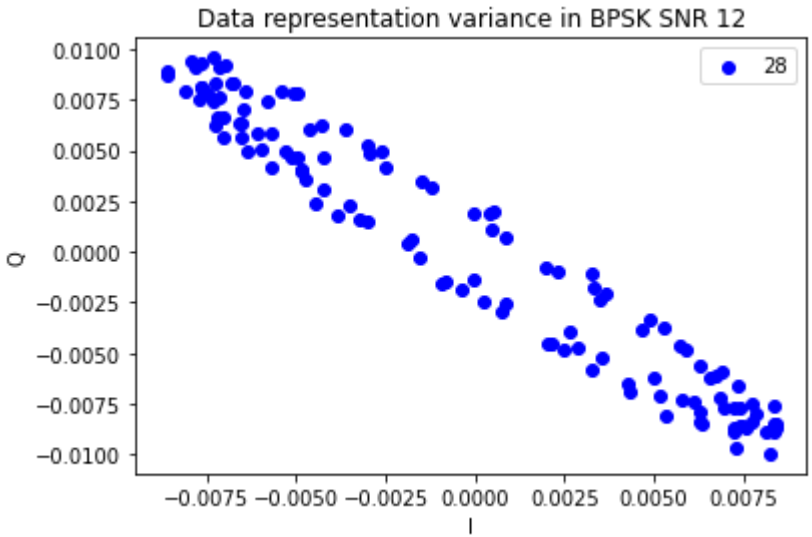

Data representation variance in BPSK SNR 12
23
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

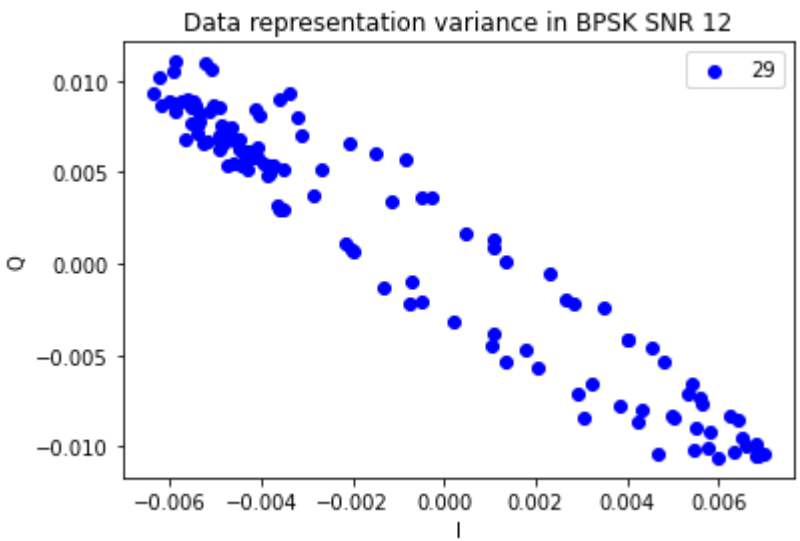

Data representation variance in BPSK SNR 12
24
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

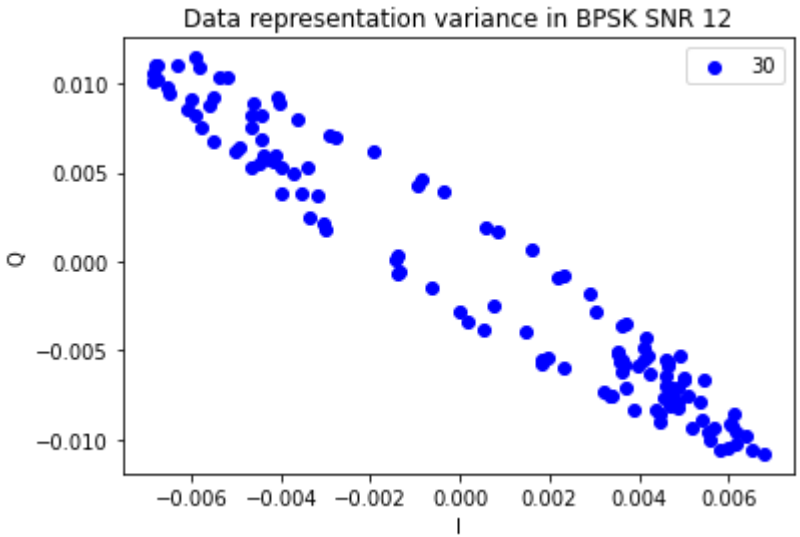

Data representation variance in BPSK SNR 12
25
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

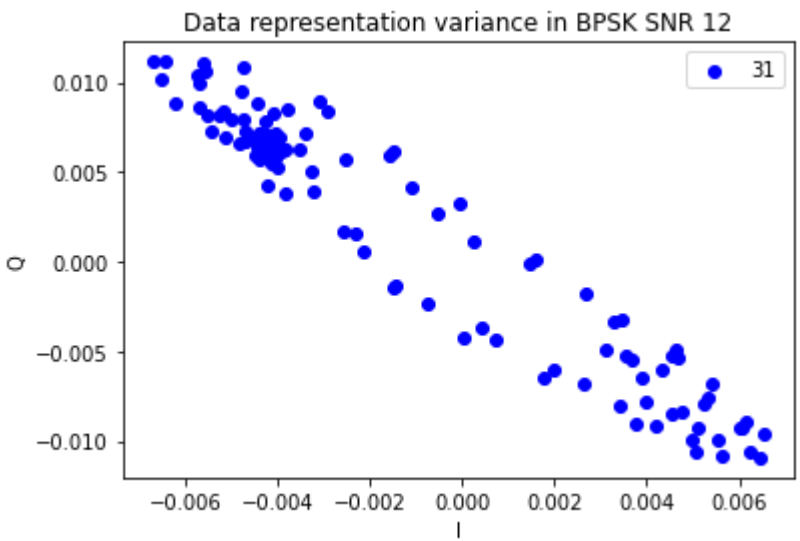

Data representation variance in BPSK SNR 12
26
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

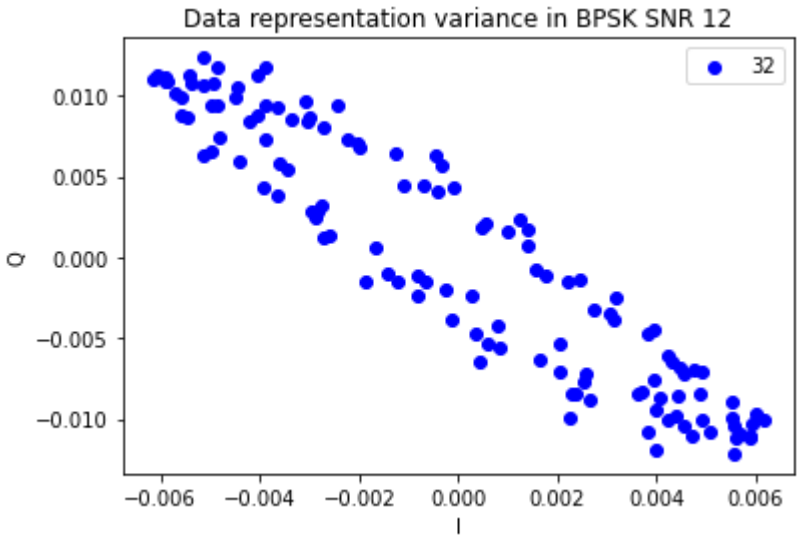

Data representation variance in BPSK SNR 12
27
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I

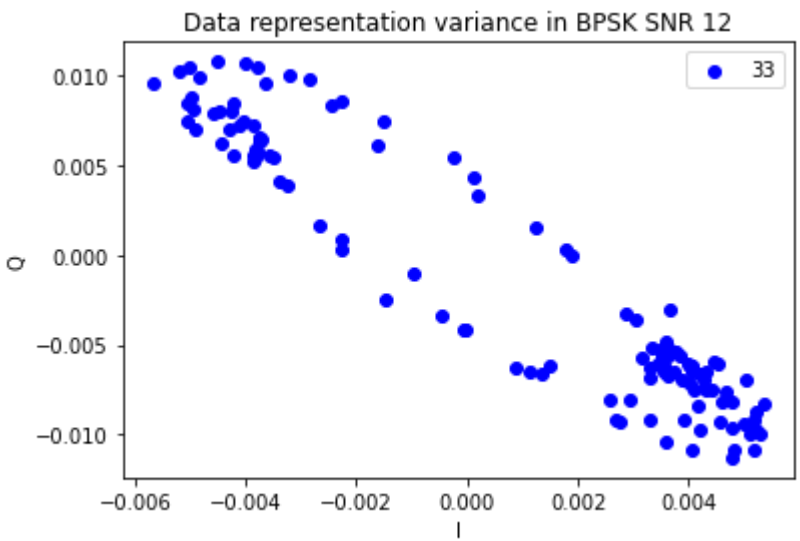

Data representation variance in BPSK SNR 12
28
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

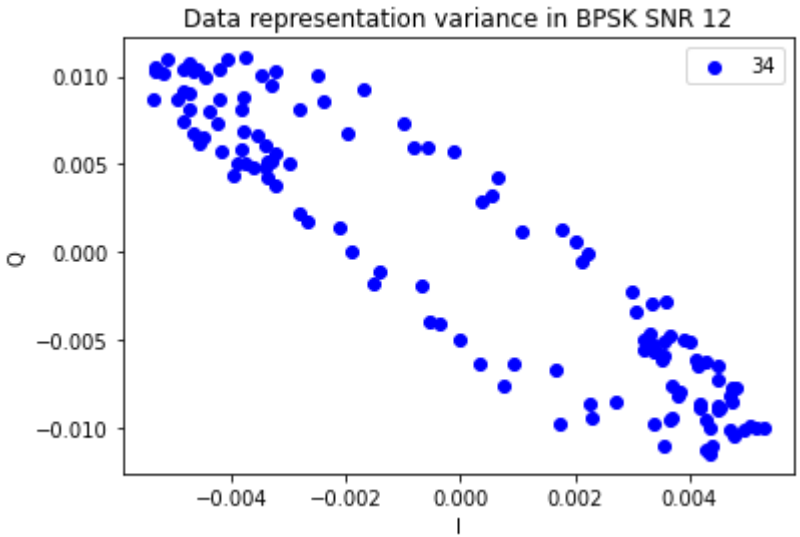

Data representation variance in BPSK SNR 12
29
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006 −0.004 −0.002 0.000 0.002 0.004 0.006
I

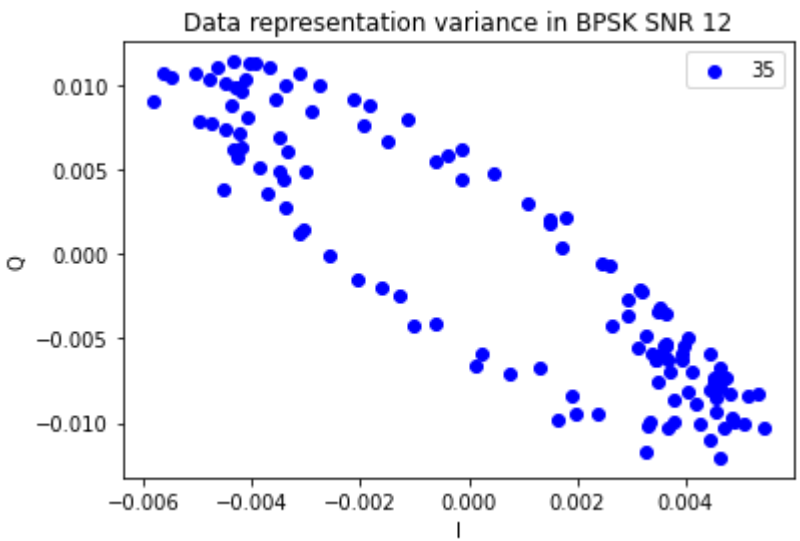

Data representation variance in BPSK SNR 12
30
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

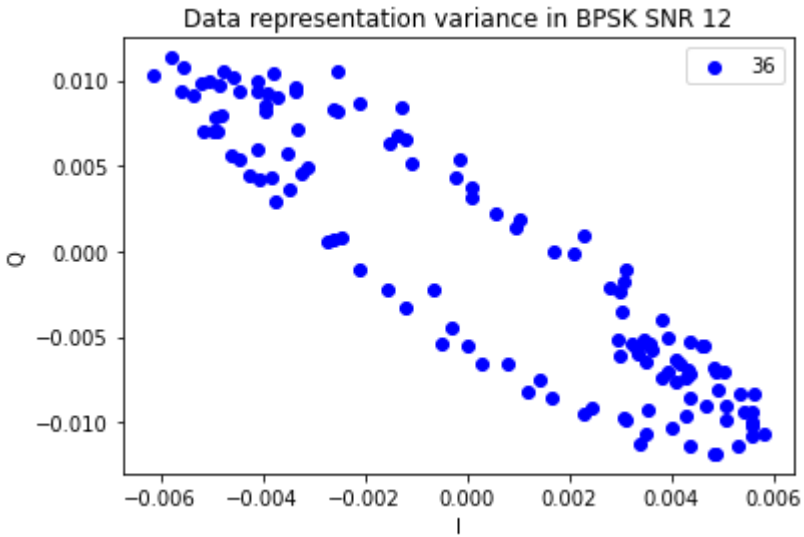

Data representation variance in BPSK SNR 12
31
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

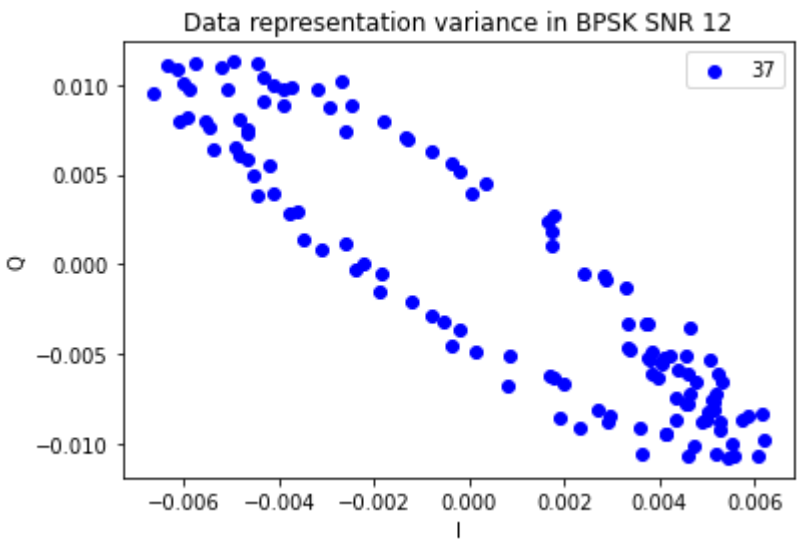

Data representation variance in BPSK SNR 12
32
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

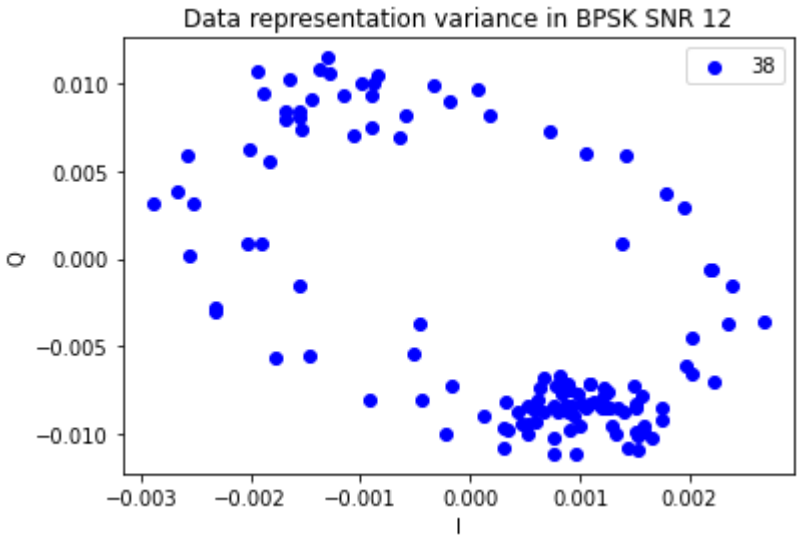

Data representation variance in BPSK SNR 12
33
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I

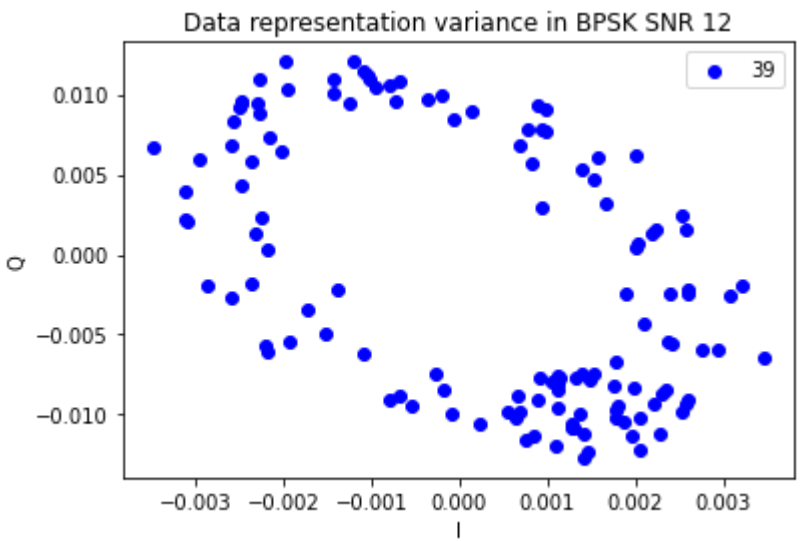

Data representation variance in BPSK SNR 12
34
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

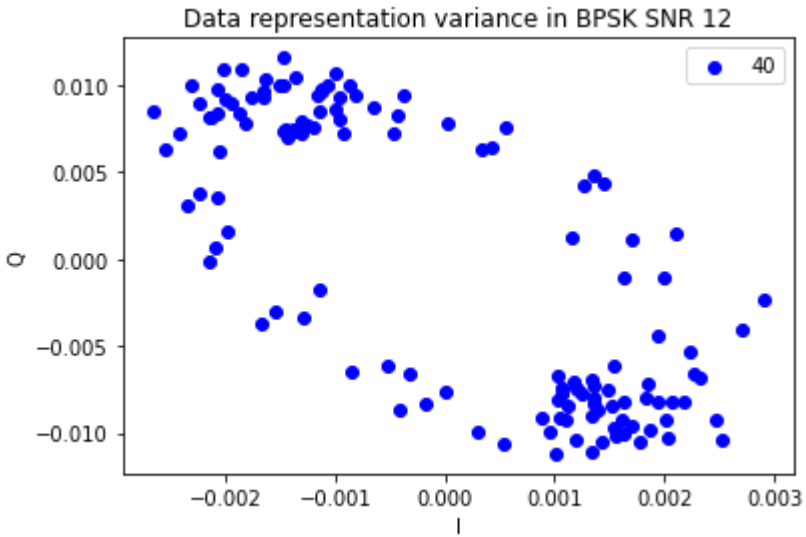

Data representation variance in BPSK SNR 12
35
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
I

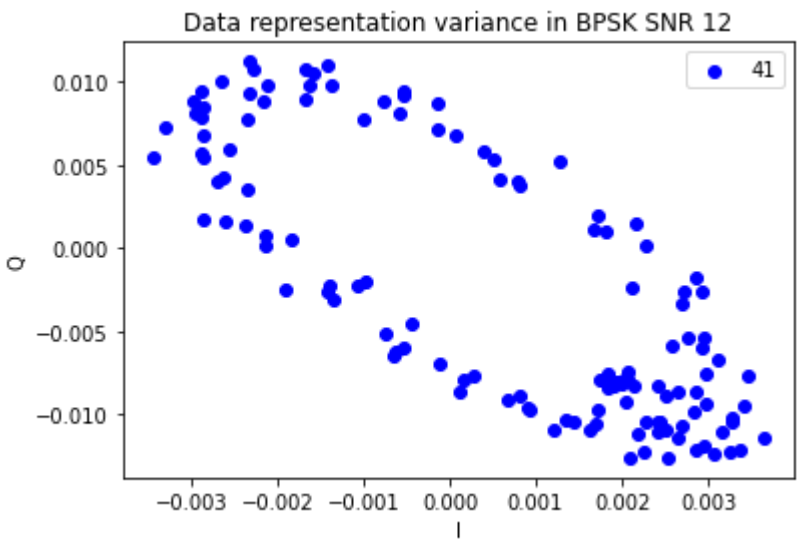

Data representation variance in BPSK SNR 12
36
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

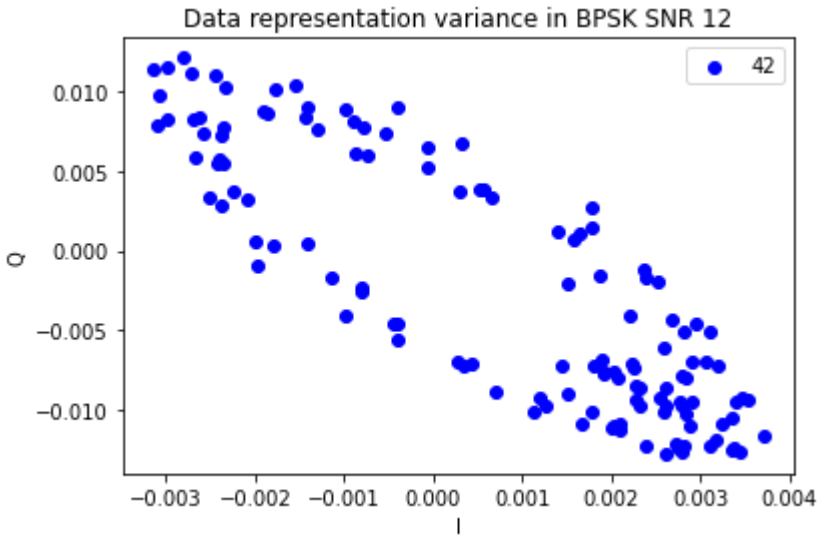

Data representation variance in BPSK SNR 12
37
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

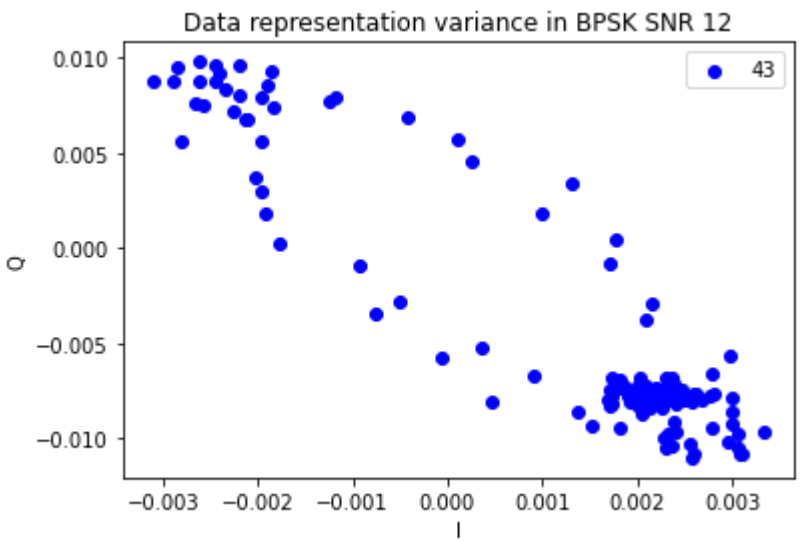

Data representation variance in BPSK SNR 12
38
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

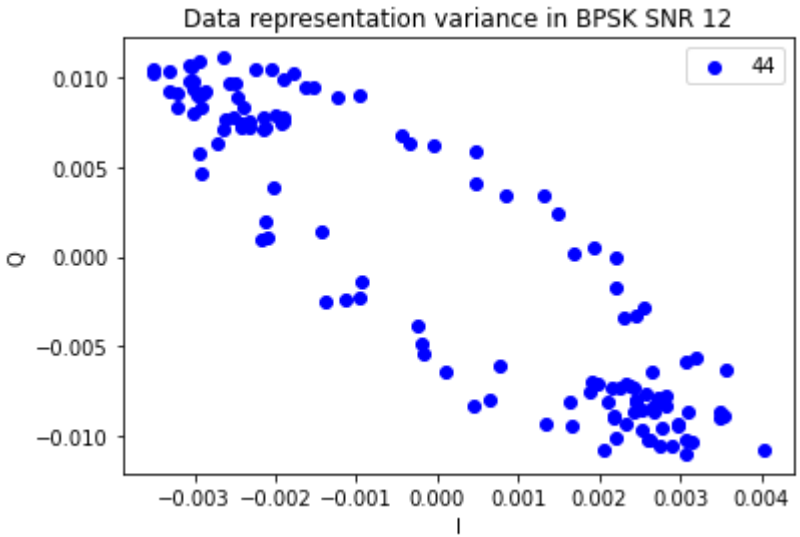

Data representation variance in BPSK SNR 12
39
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

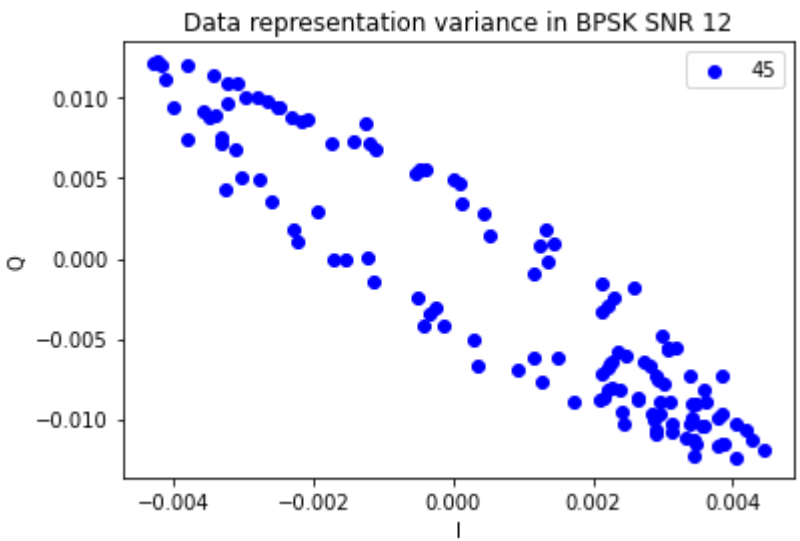

Data representation variance in BPSK SNR 12
40
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

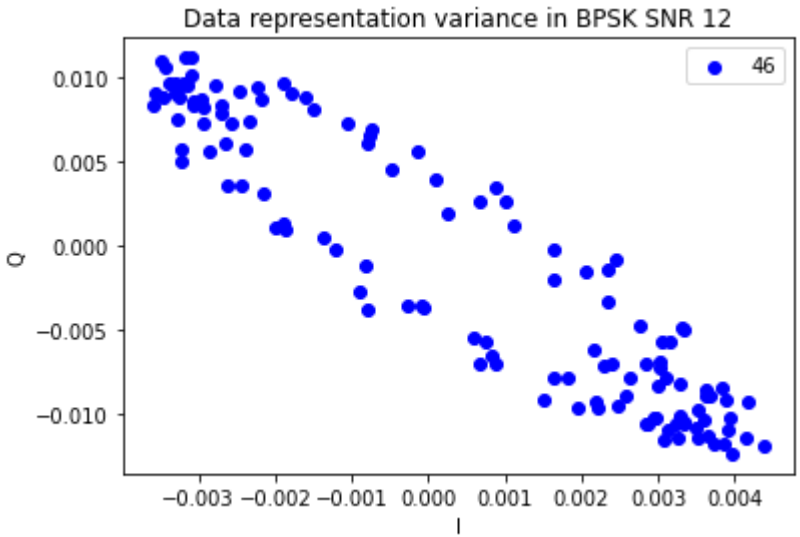

Data representation variance in BPSK SNR 12
41
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

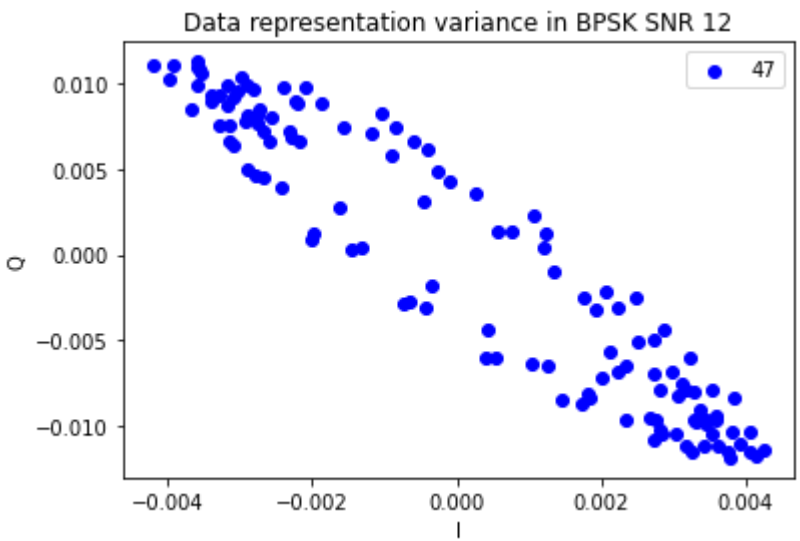

Data representation variance in BPSK SNR 12
42
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
0.004
I

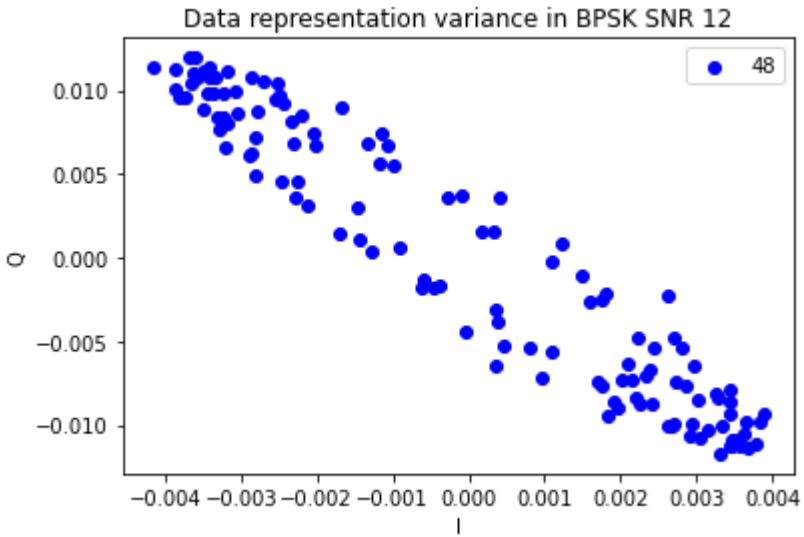

Data representation variance in BPSK SNR 12
43
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

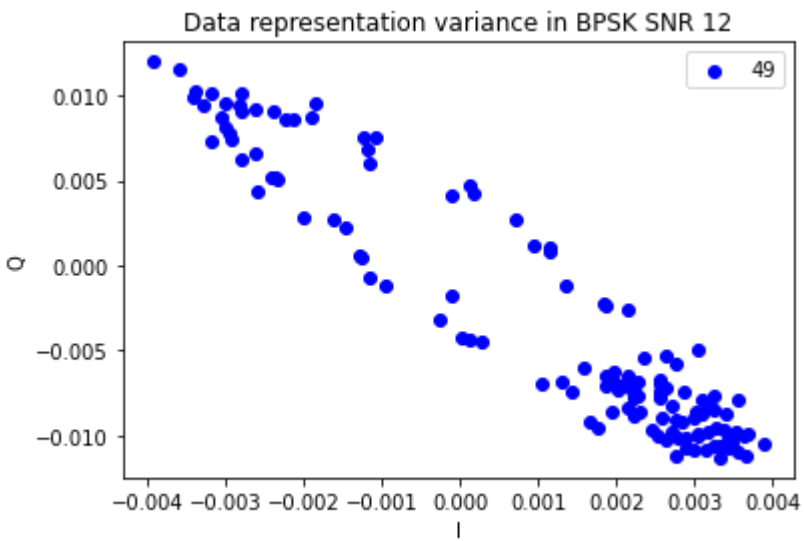

Data representation variance in BPSK SNR 12
44
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

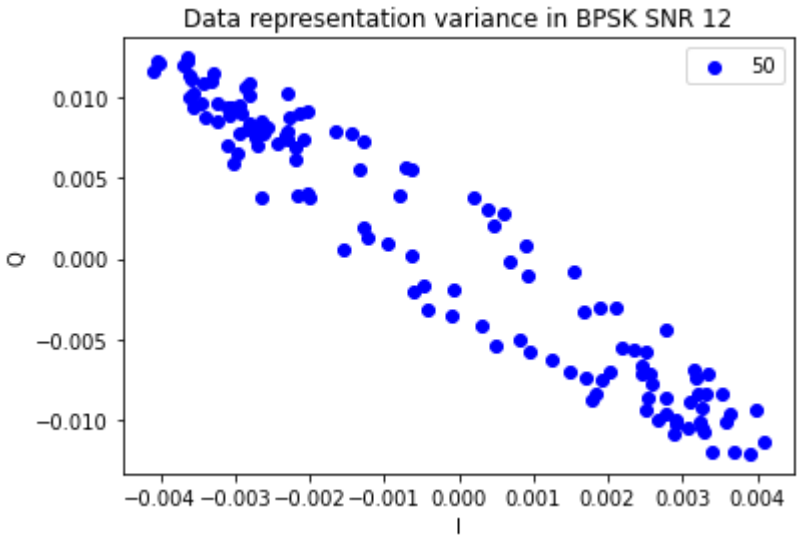

Data representation variance in BPSK SNR 12
45
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

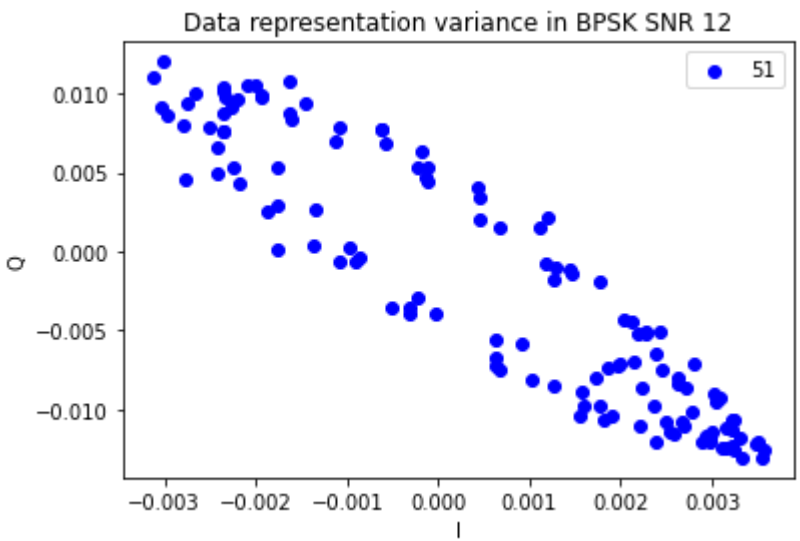

Data representation variance in BPSK SNR 12
46
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

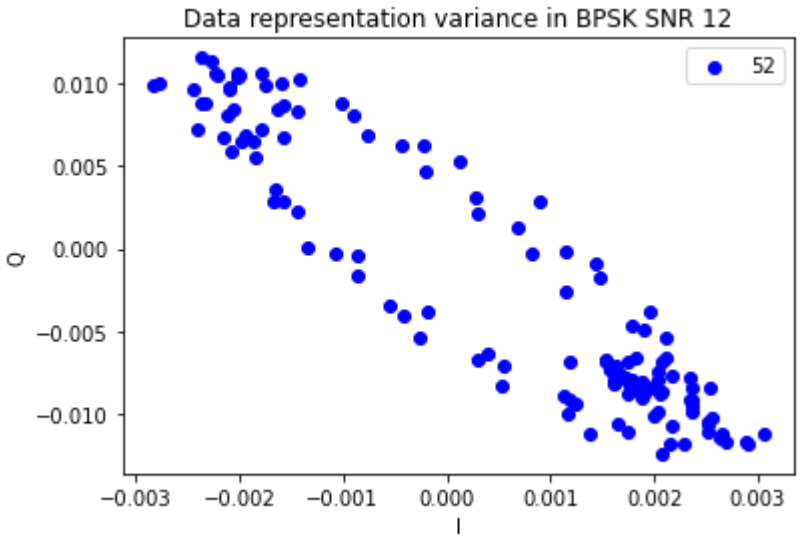

Data representation variance in BPSK SNR 12
47
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

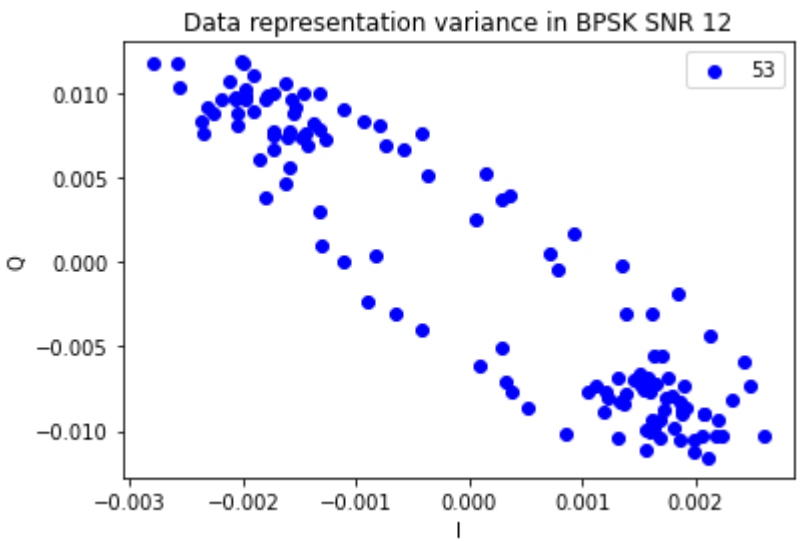

Data representation variance in BPSK SNR 12
48
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

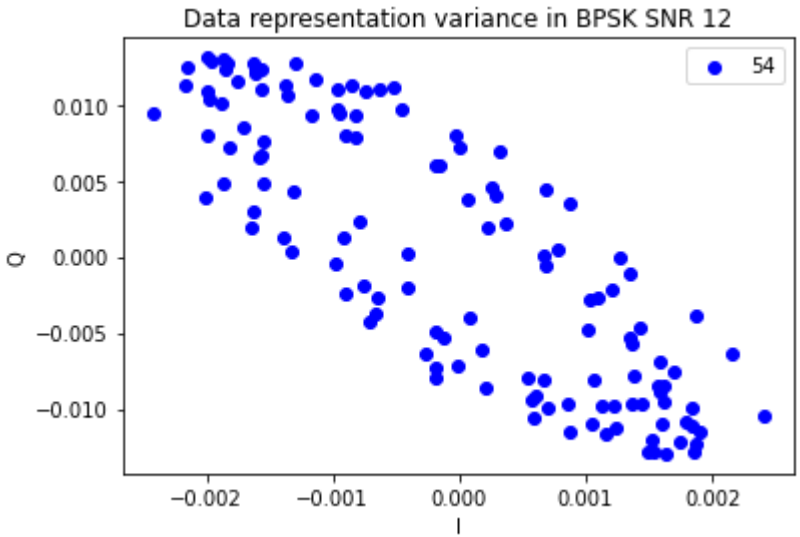

Data representation variance in BPSK SNR 12
49
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

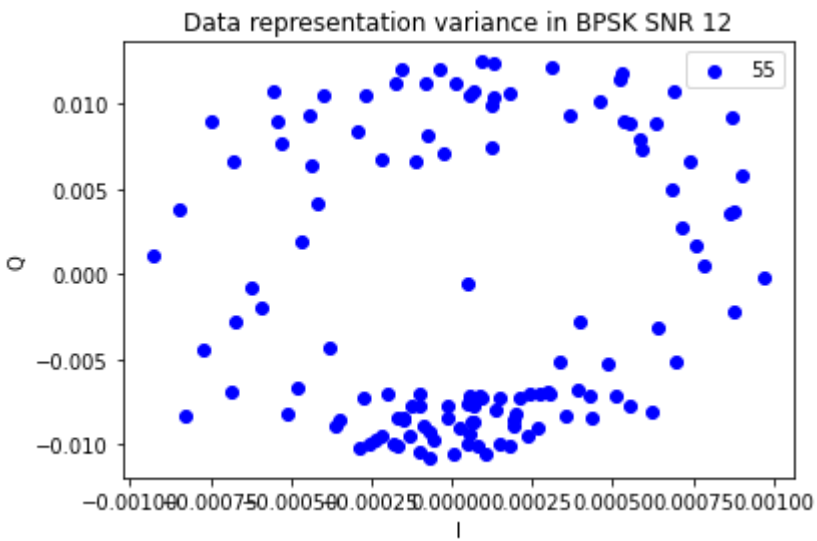

Data representation variance in BPSK SNR 12
50
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

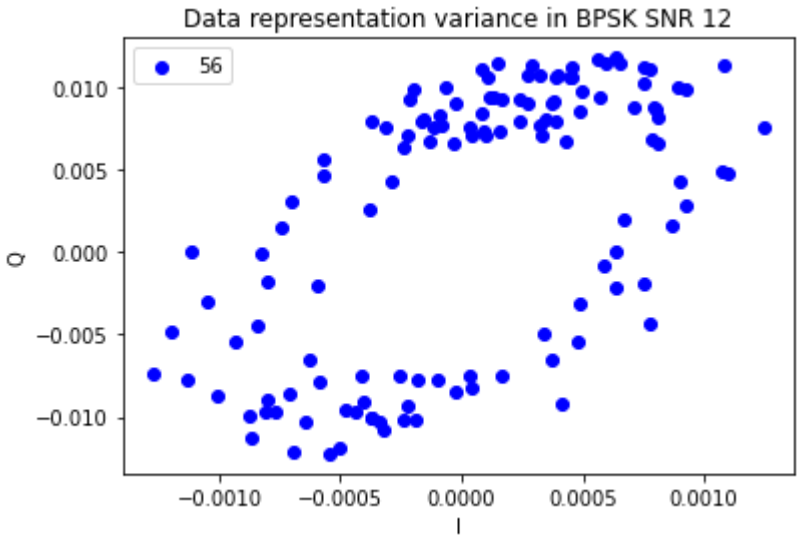

Data representation variance in BPSK SNR 12
51
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

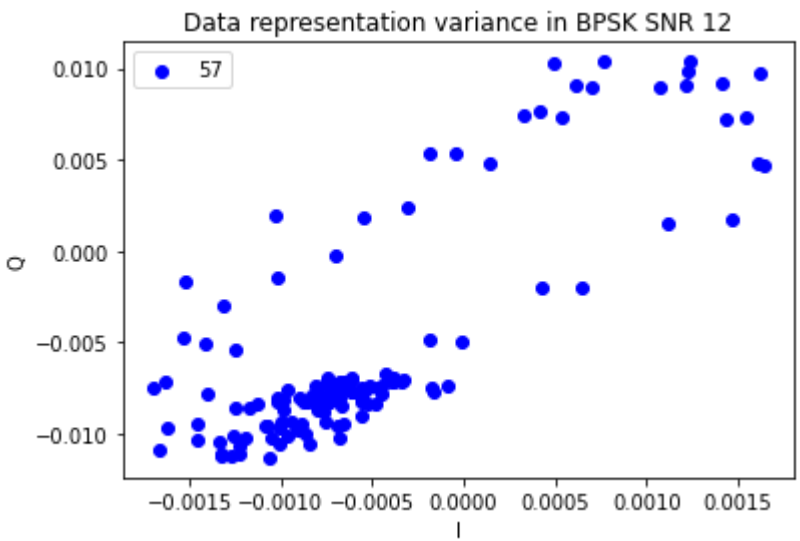

Data representation variance in BPSK SNR 12
52
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

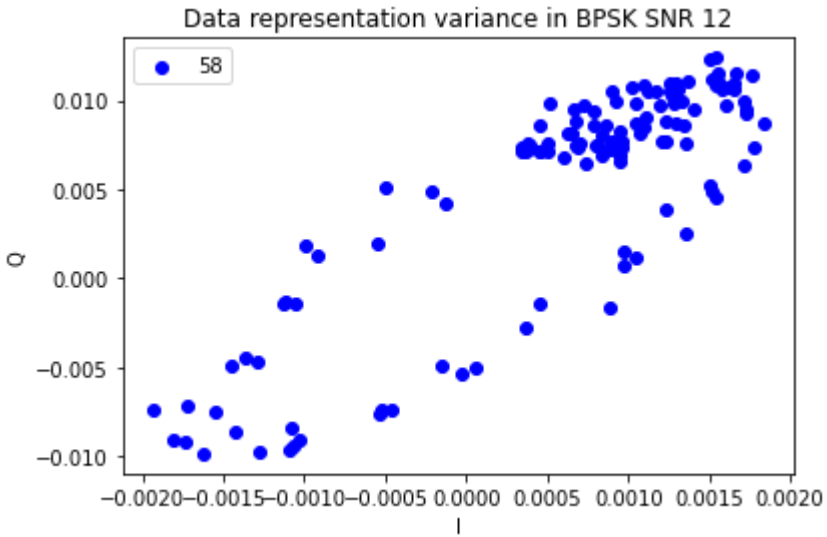

Data representation variance in BPSK SNR 12
53
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

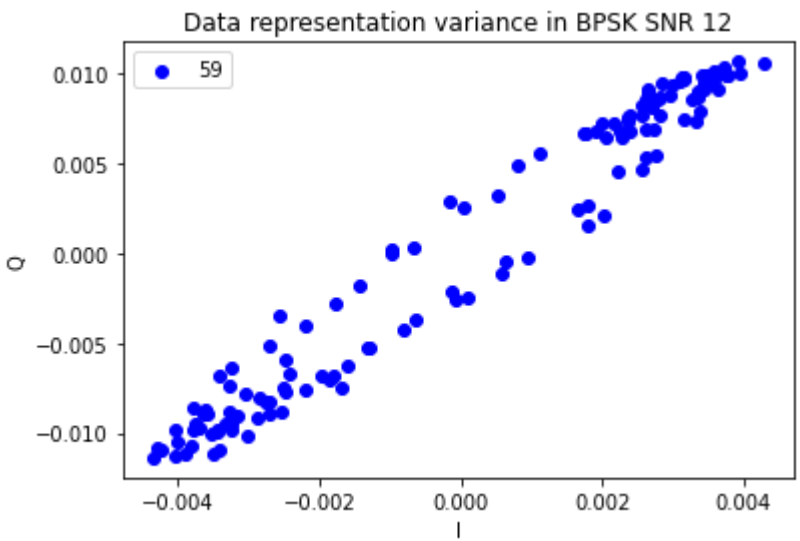

Data representation variance in BPSK SNR 12
54
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

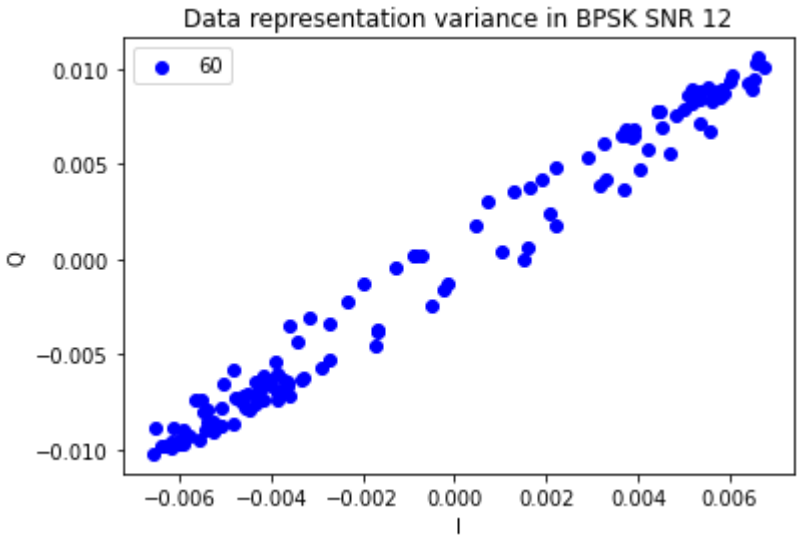

Data representation variance in BPSK SNR 12
55
0.010
0.005
0.000
−0.005
−0.010
Q
I

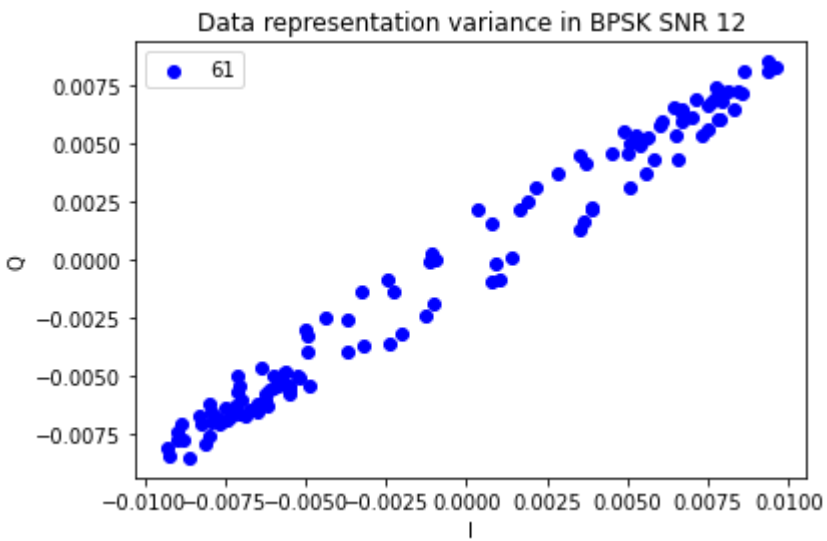

Data representation variance in BPSK SNR 12
56
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0010
−0.0005
0.0000
0.0005
0.0010
I

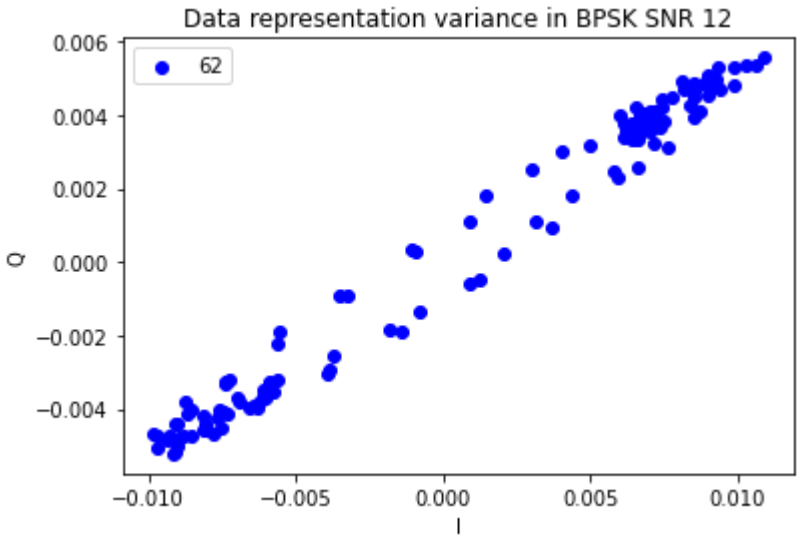

Data representation variance in BPSK SNR 12
57
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

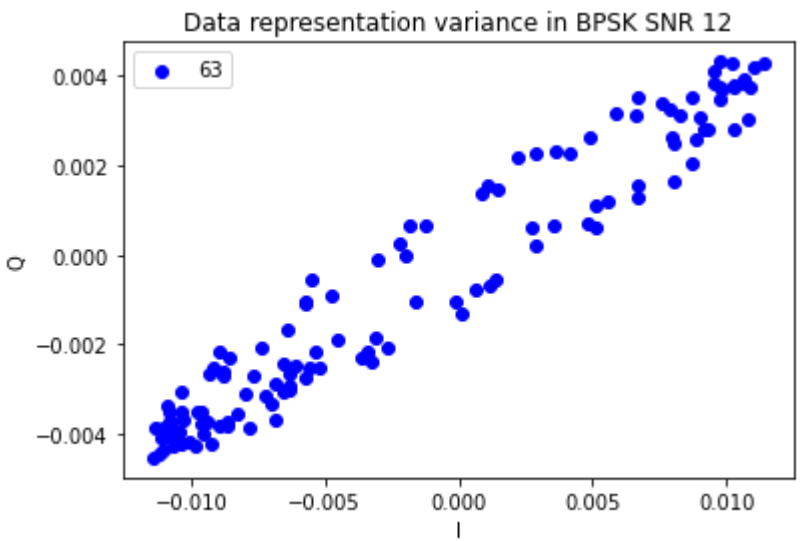

Data representation variance in BPSK SNR 12
58
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

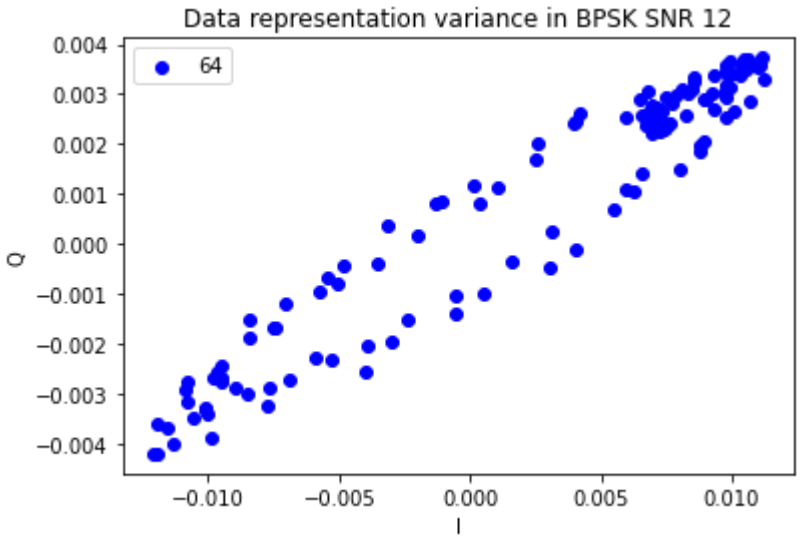

Data representation variance in BPSK SNR 12
59
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.002 0.000 0.002 0.004
I

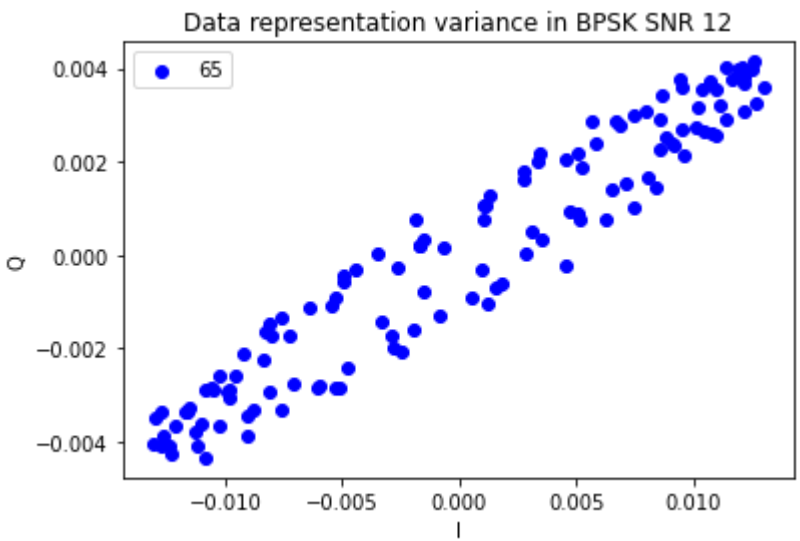

Data representation variance in BPSK SNR 12
60
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

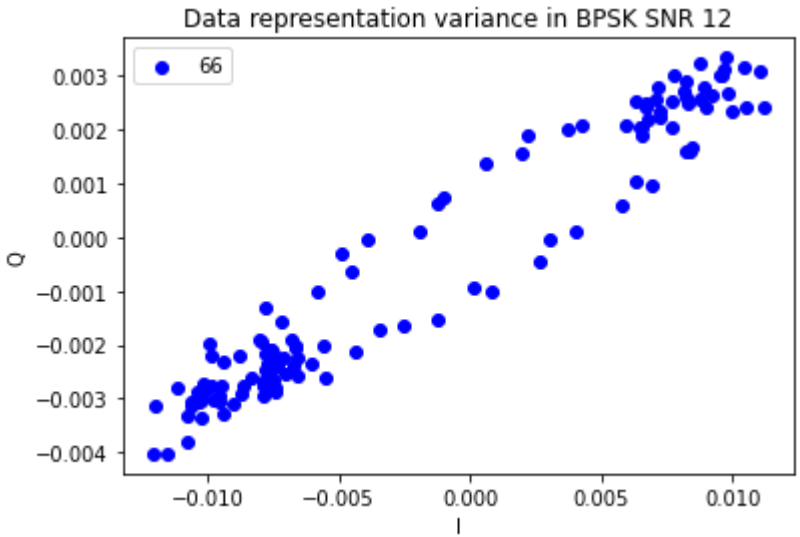

Data representation variance in BPSK SNR 12
61
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

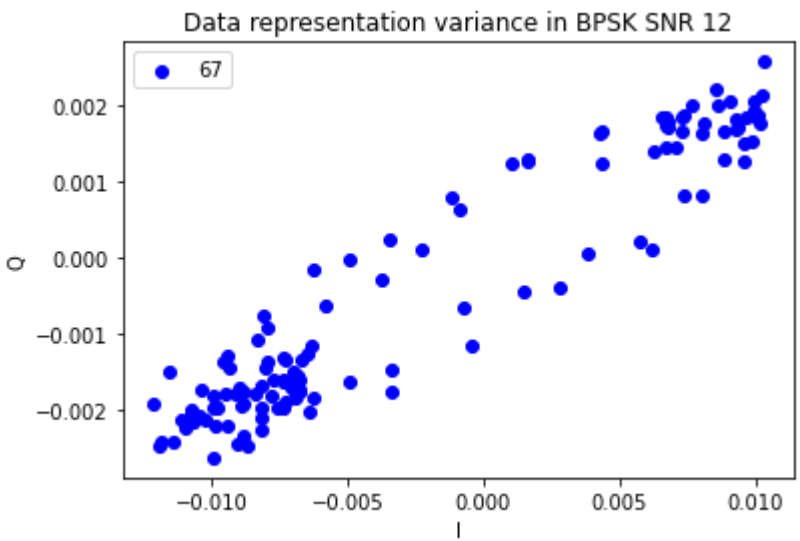

Data representation variance in BPSK SNR 12
62
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

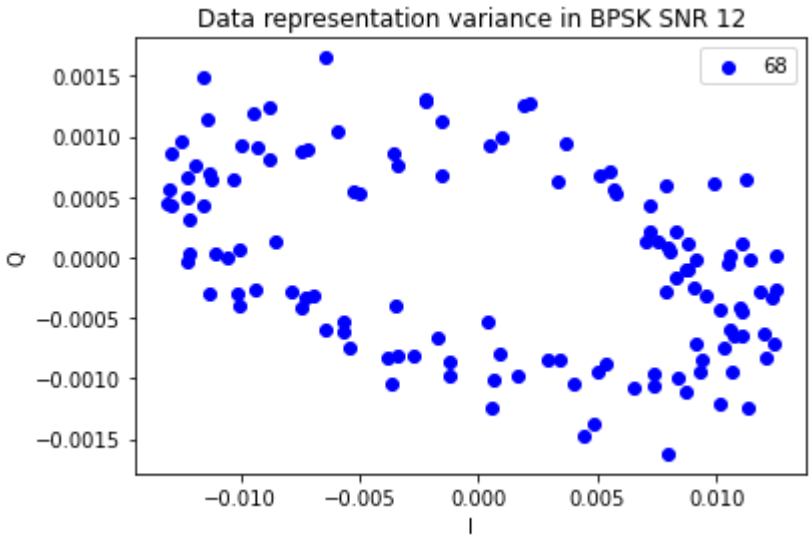

Data representation variance in BPSK SNR 12
63
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

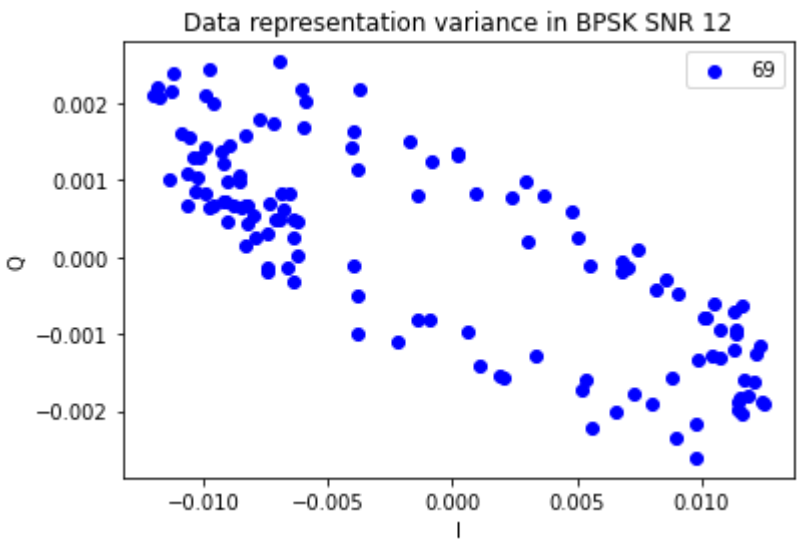

Data representation variance in BPSK SNR 12
64
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

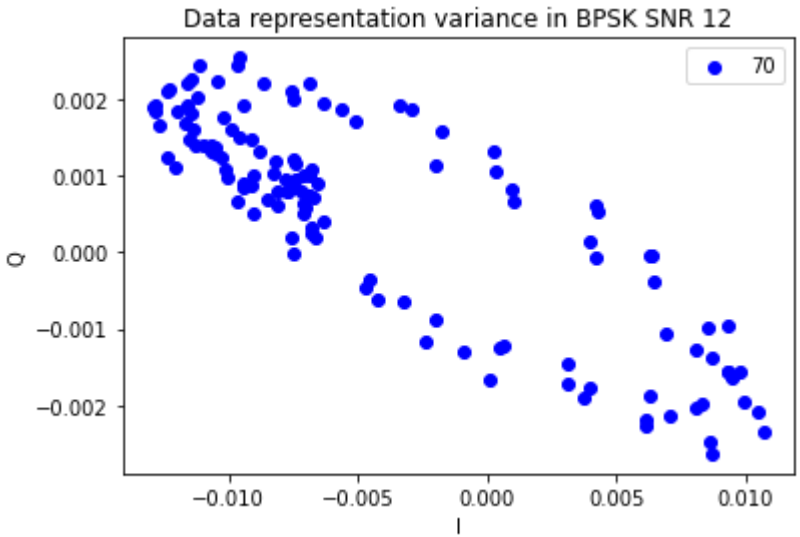

Data representation variance in BPSK SNR 12
65
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

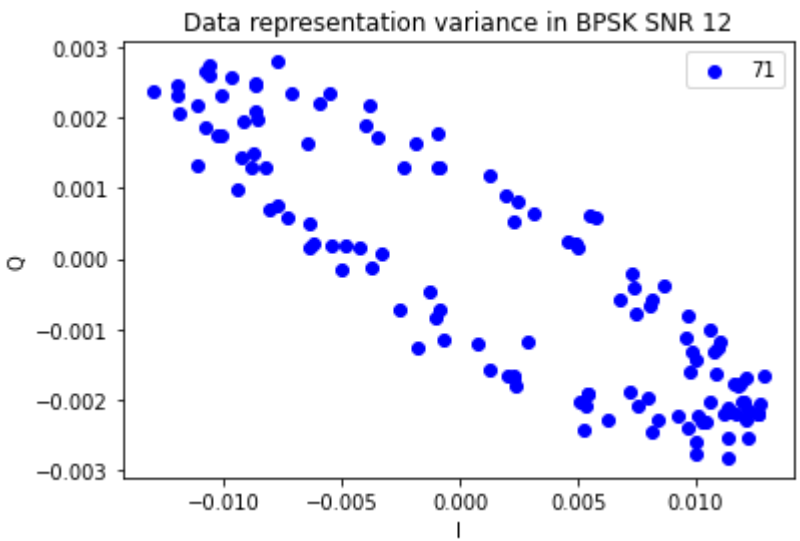

Data representation variance in BPSK SNR 12
66
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

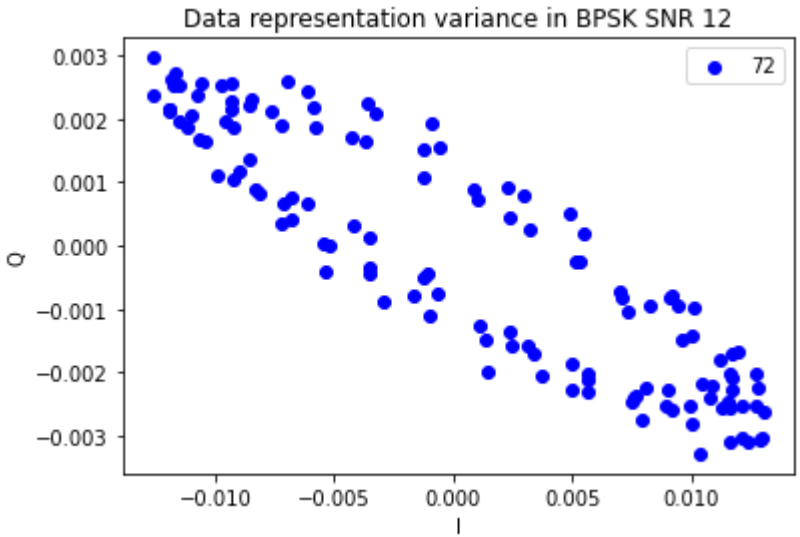

Data representation variance in BPSK SNR 12
67
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

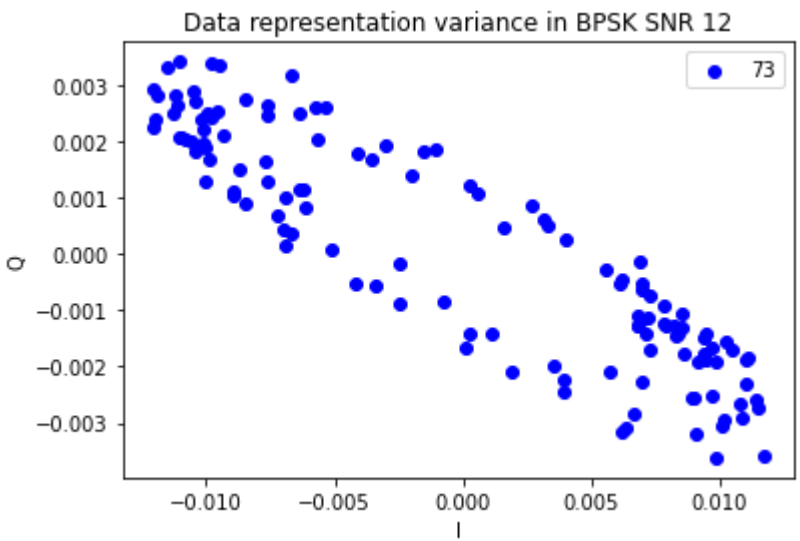

Data representation variance in BPSK SNR 12
68
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

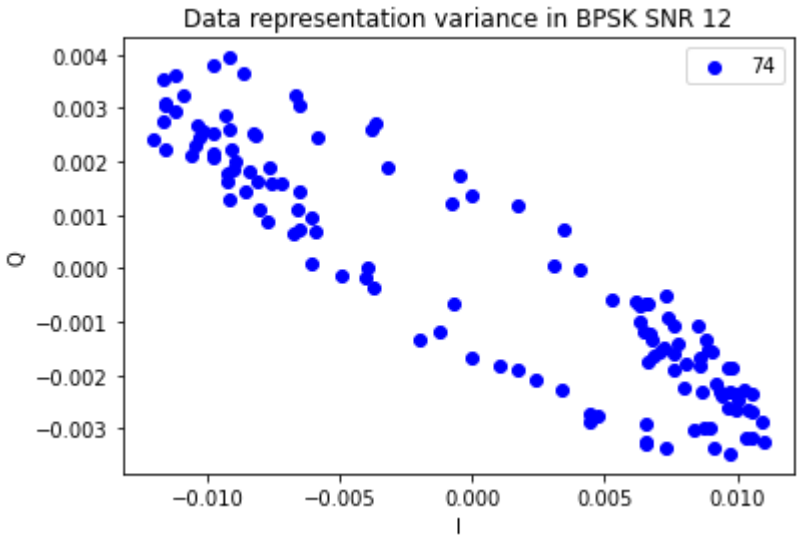

Data representation variance in BPSK SNR 12
69
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

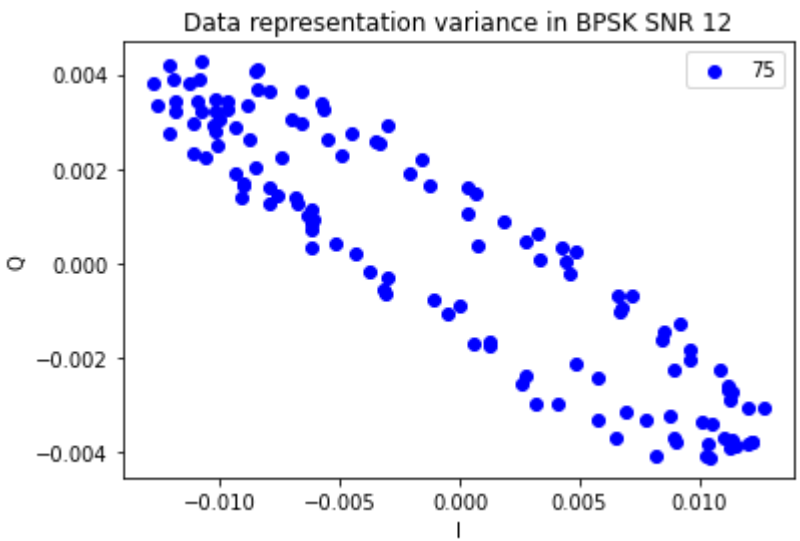

Data representation variance in BPSK SNR 12
70
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

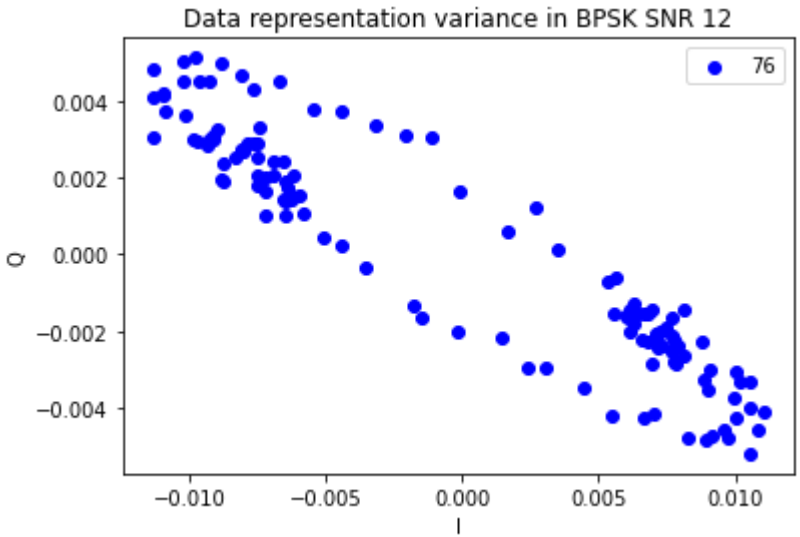

Data representation variance in BPSK SNR 12
71
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

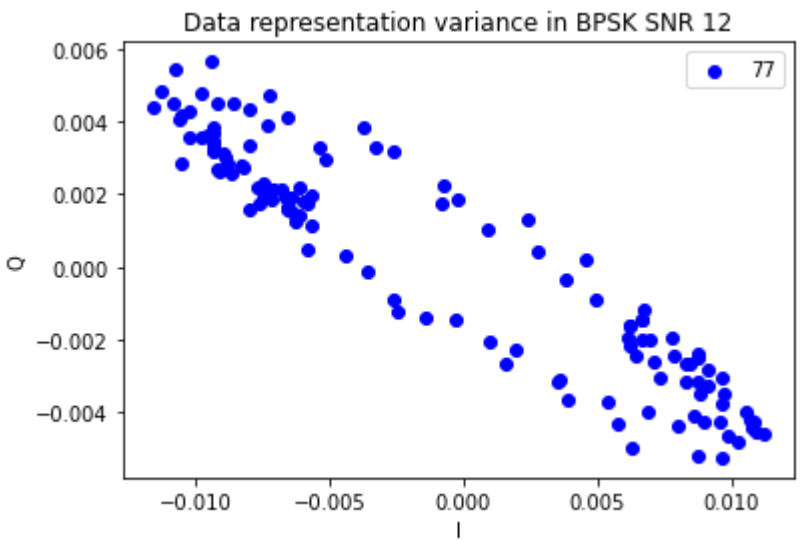

Data representation variance in BPSK SNR 12
72
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

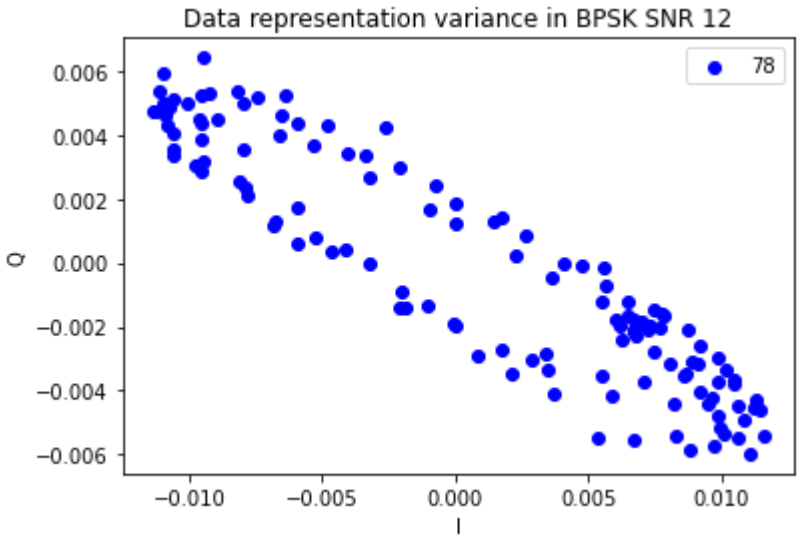

Data representation variance in BPSK SNR 12
73
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

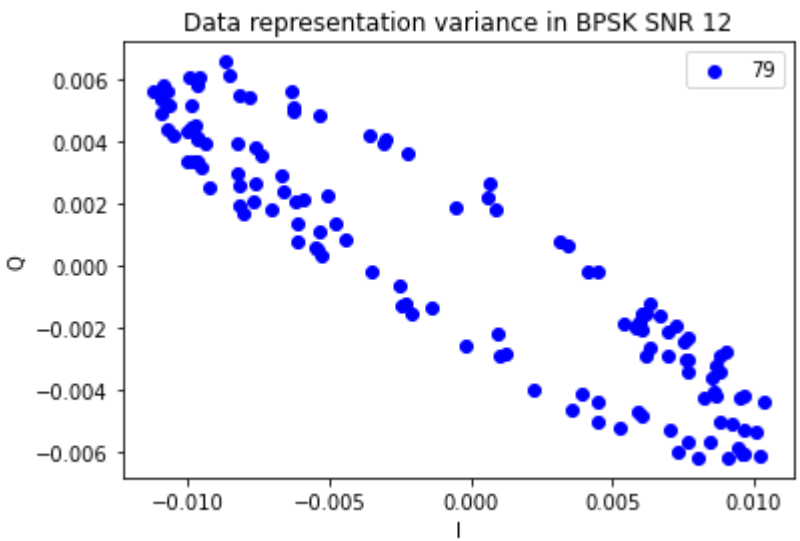

Data representation variance in BPSK SNR 12
74
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

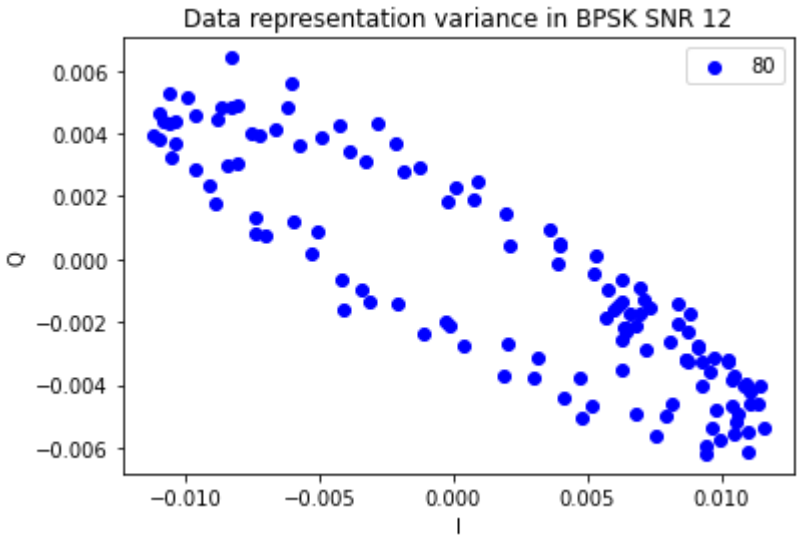

Data representation variance in BPSK SNR 12
75
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

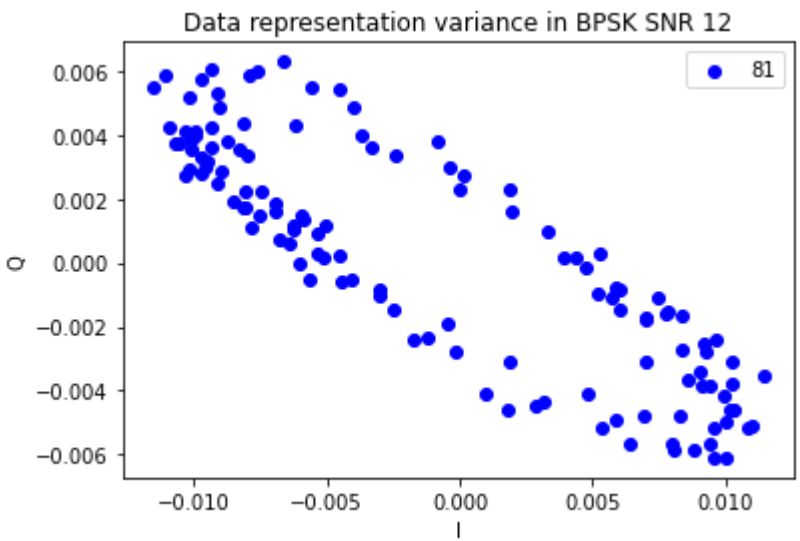

Data representation variance in BPSK SNR 12
76
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

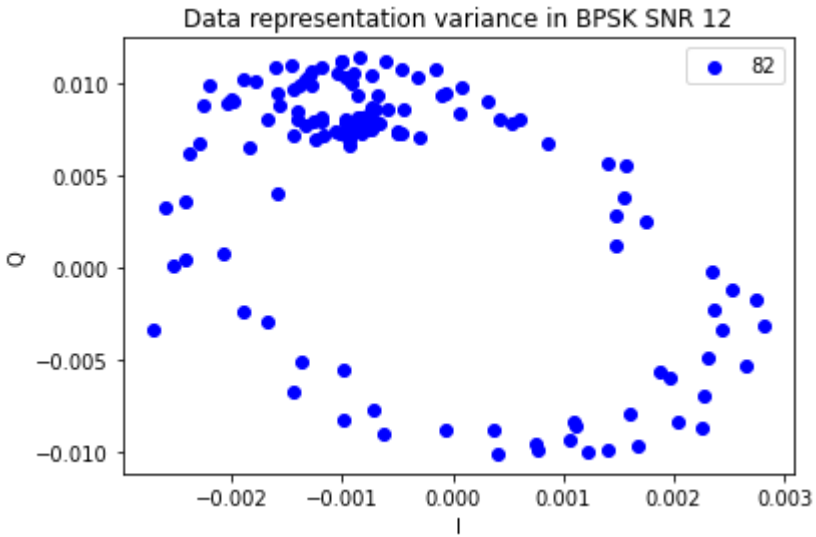

Data representation variance in BPSK SNR 12
77
0.006
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

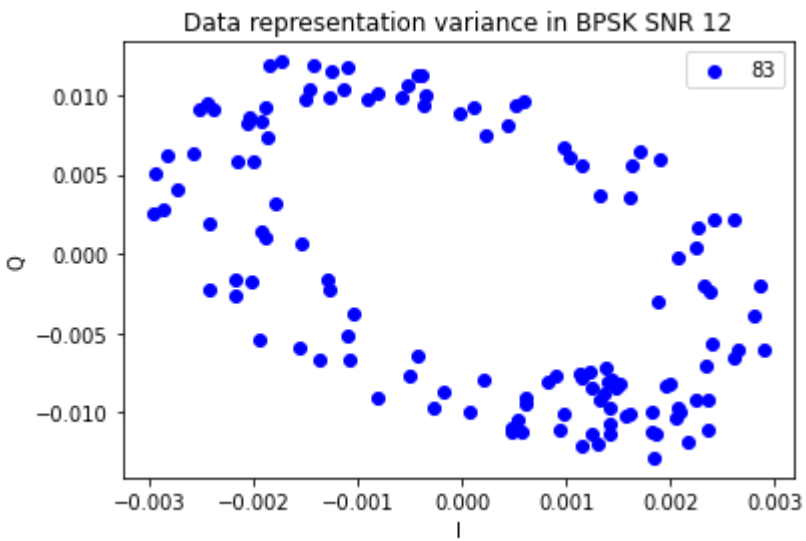

Data representation variance in BPSK SNR 12
78
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

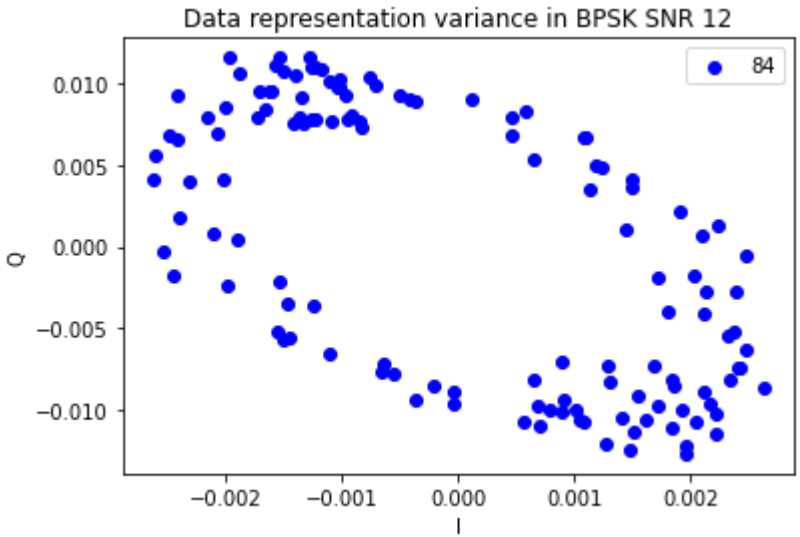

Data representation variance in BPSK SNR 12
79
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

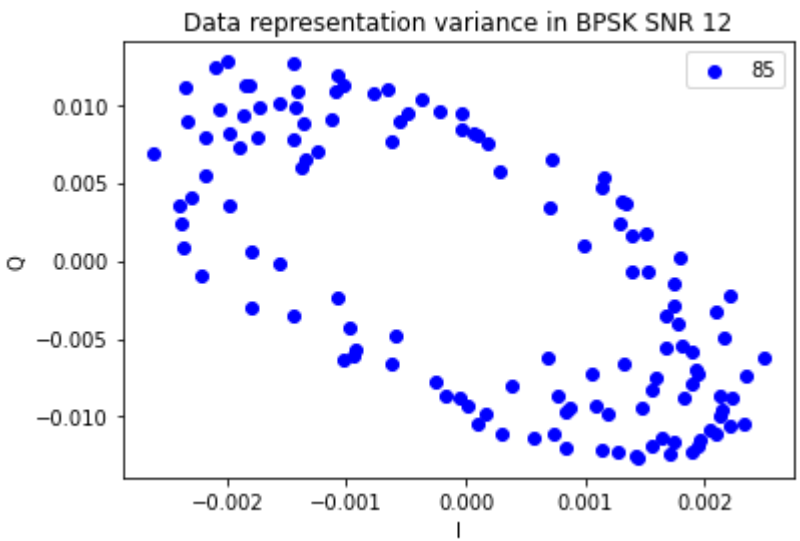

Data representation variance in BPSK SNR 12
80
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

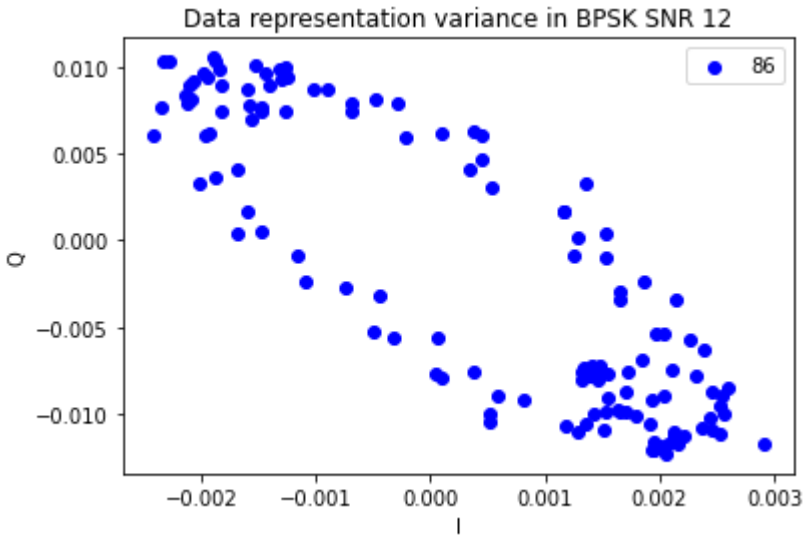

Data representation variance in BPSK SNR 12
81
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

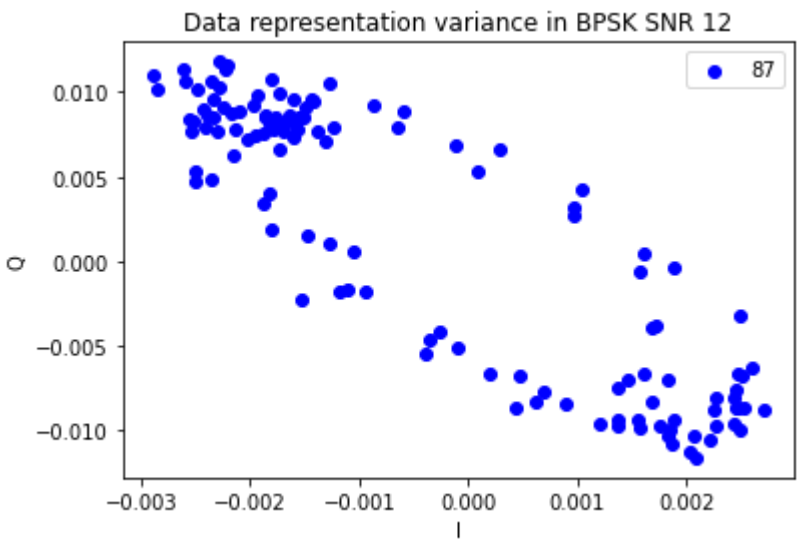

Data representation variance in BPSK SNR 12
82
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

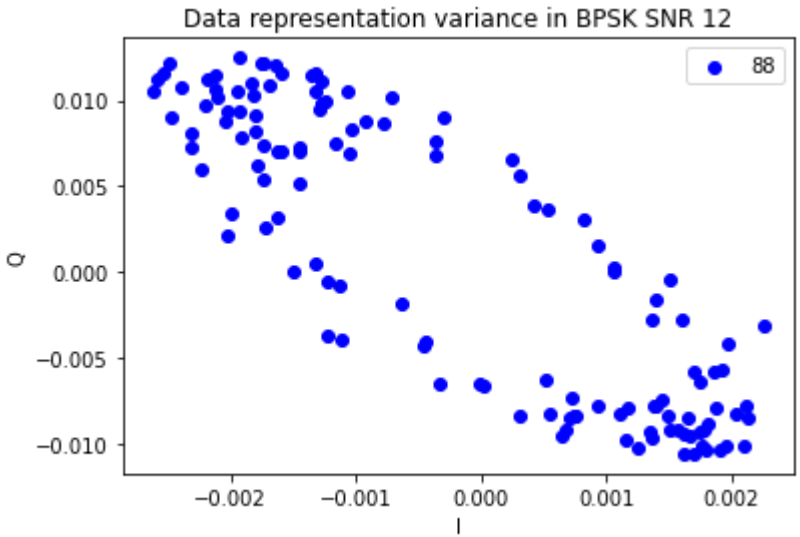

Data representation variance in BPSK SNR 12
83
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

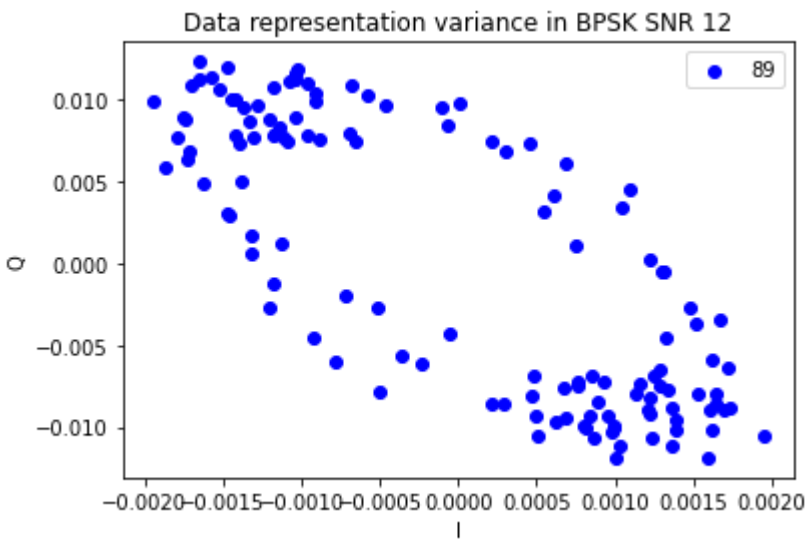

Data representation variance in BPSK SNR 12
84
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

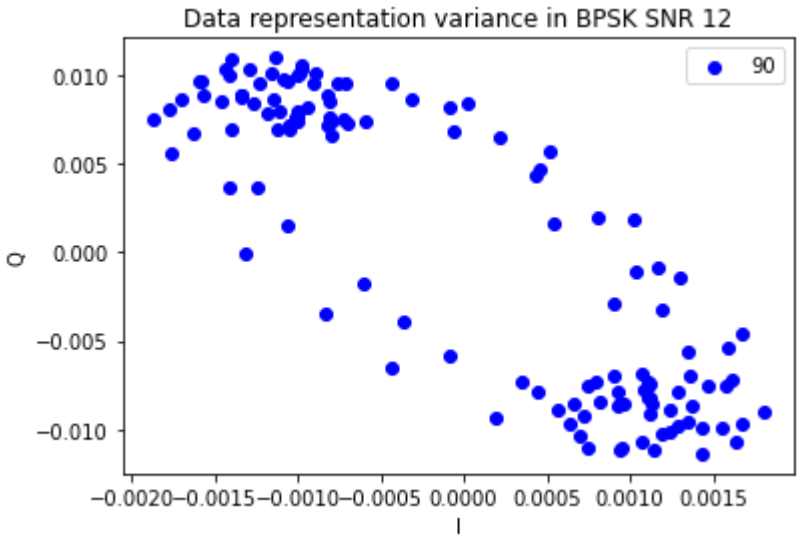

Data representation variance in BPSK SNR 12
85
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

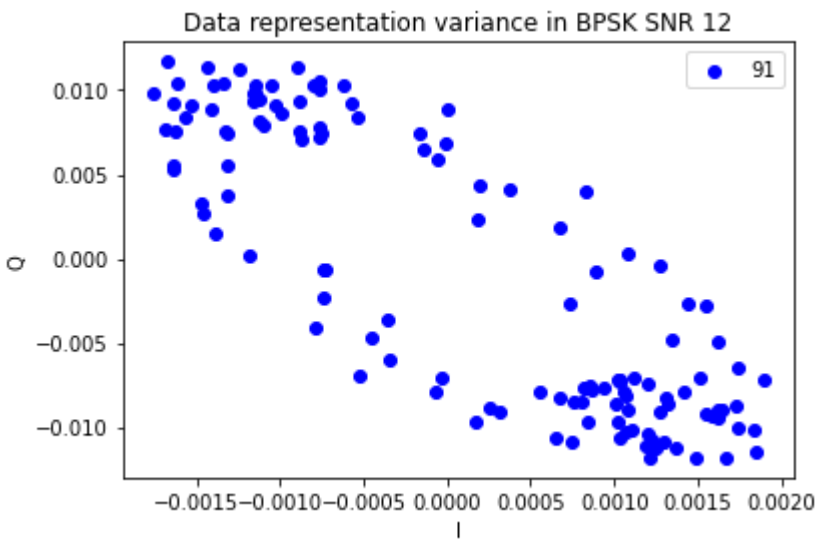

Data representation variance in BPSK SNR 12
86
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
0.003
I

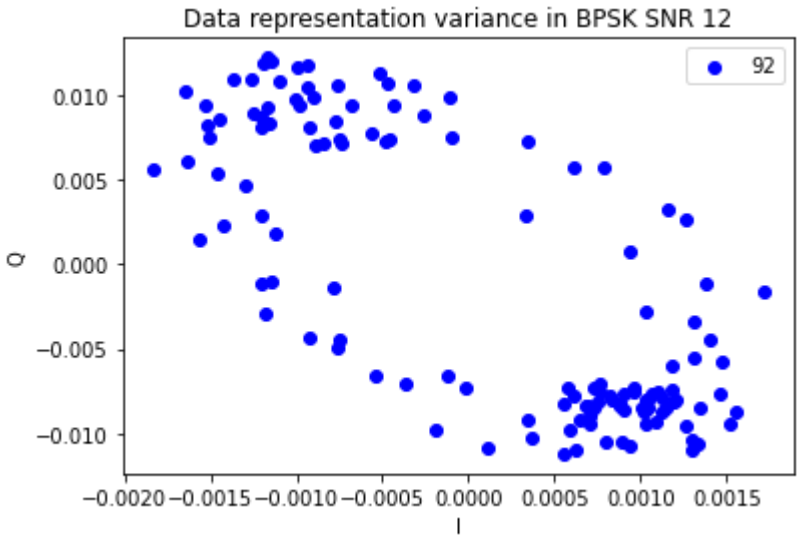

Data representation variance in BPSK SNR 12
87
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
I

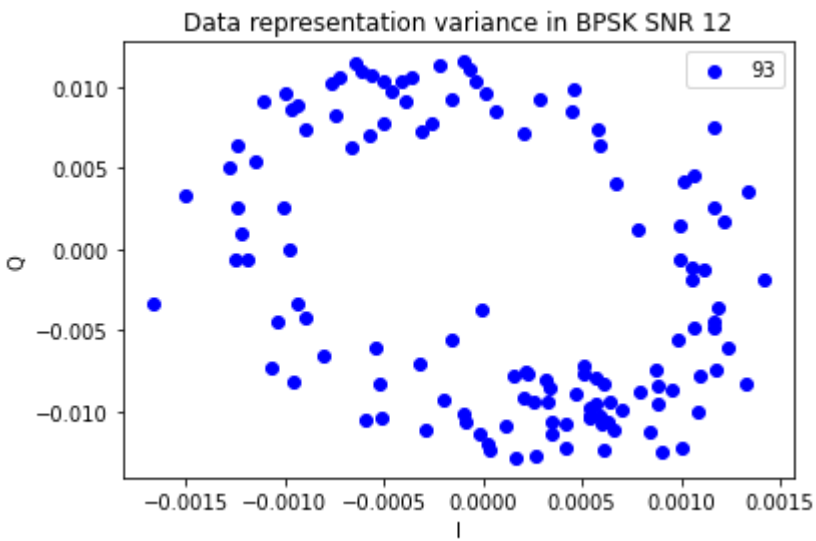

Data representation variance in BPSK SNR 12
88
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

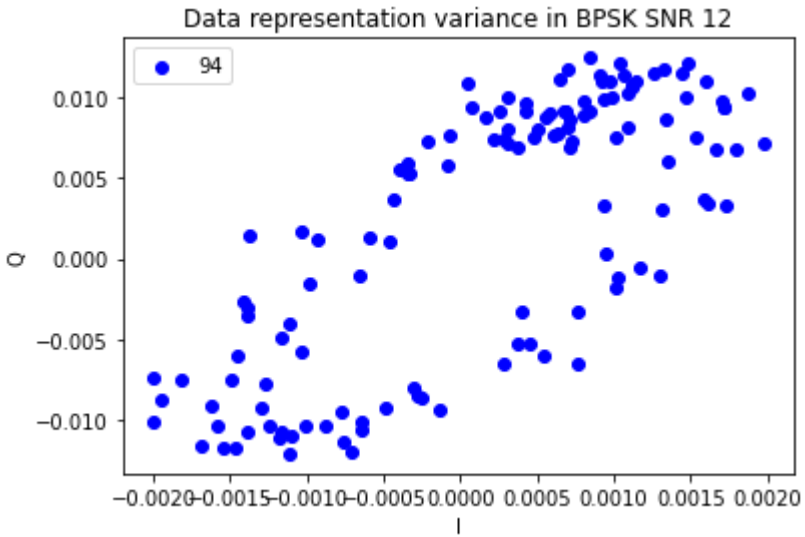

Data representation variance in BPSK SNR 12
89
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
I

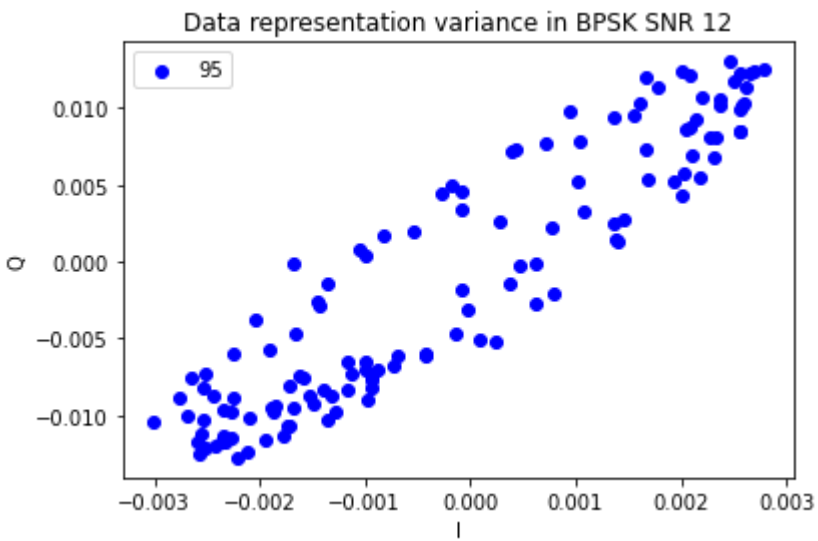

Data representation variance in BPSK SNR 12
90
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

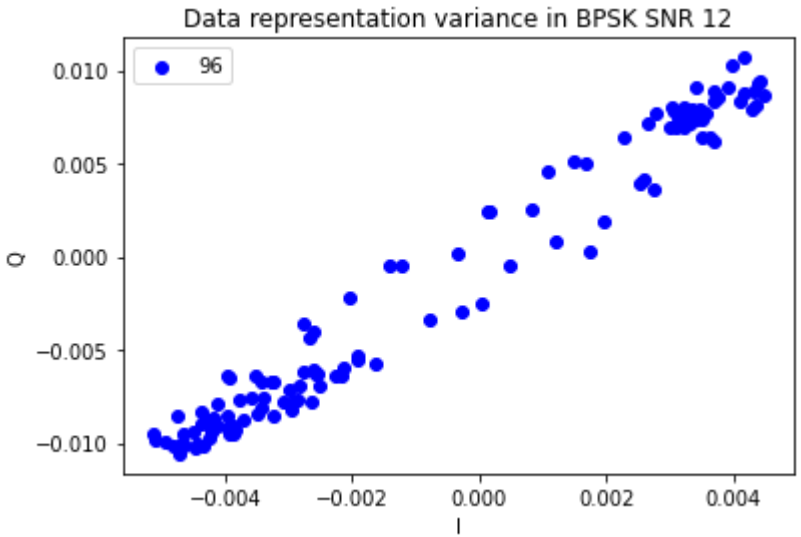

Data representation variance in BPSK SNR 12
91
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

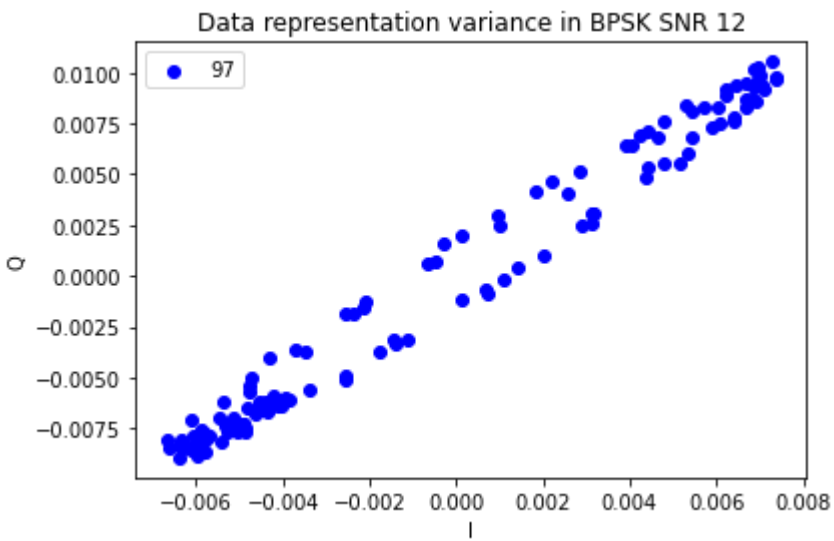

Data representation variance in BPSK SNR 12
92
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

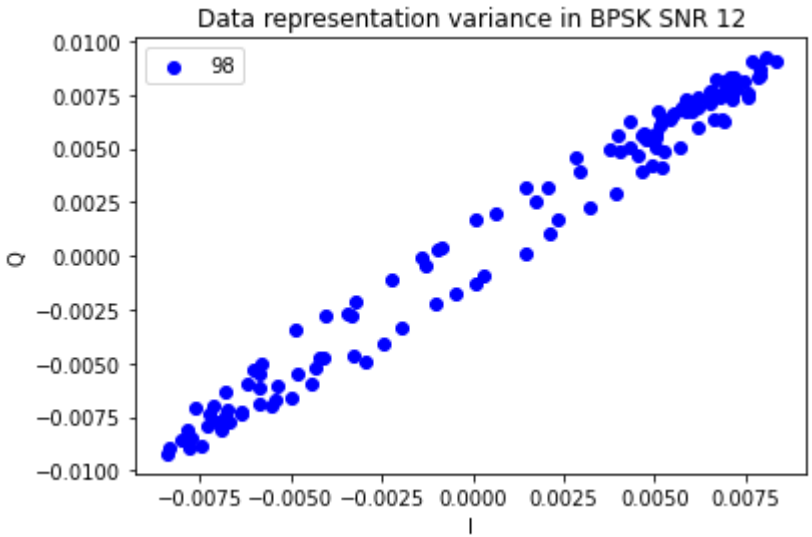

Data representation variance in BPSK SNR 12
93
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015
I

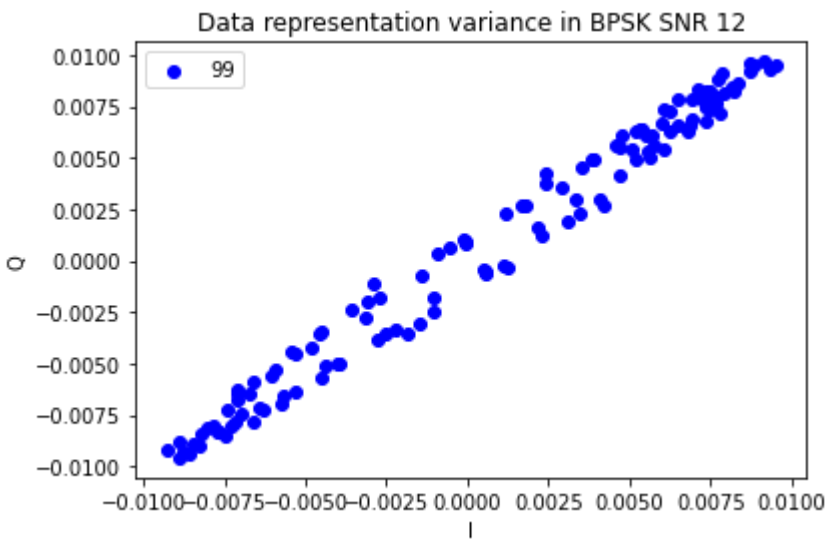

Data representation variance in BPSK SNR 12
94
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0020 −0.0015 −0.0010 −0.0005 0.0000 0.0005 0.0010 0.0015 0.0020
I

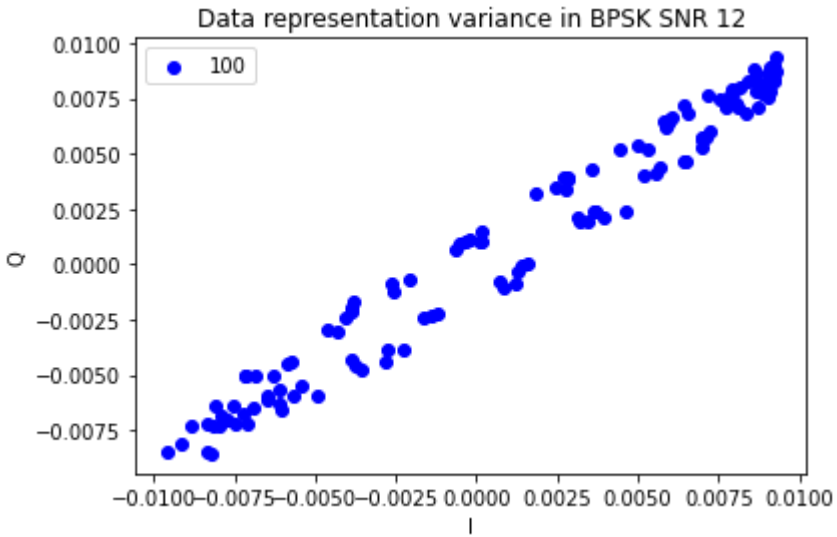

Data representation variance in BPSK SNR 12
95
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003
I

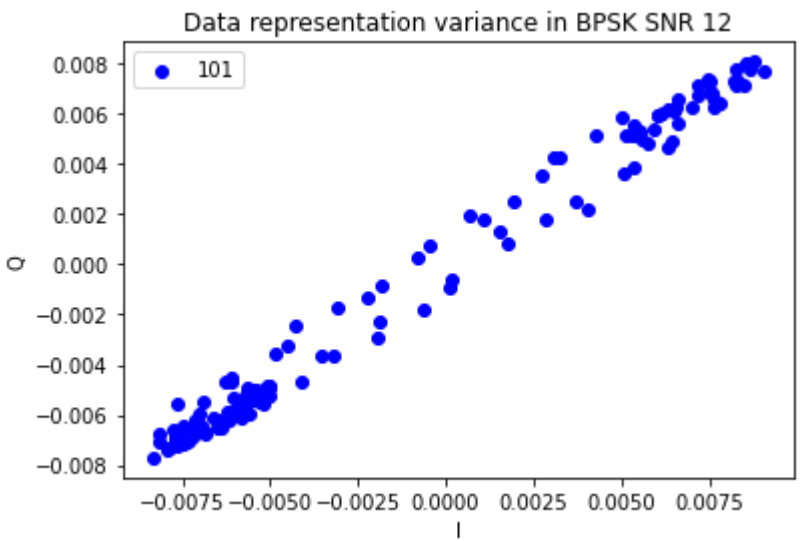

Data representation variance in BPSK SNR 12
96
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

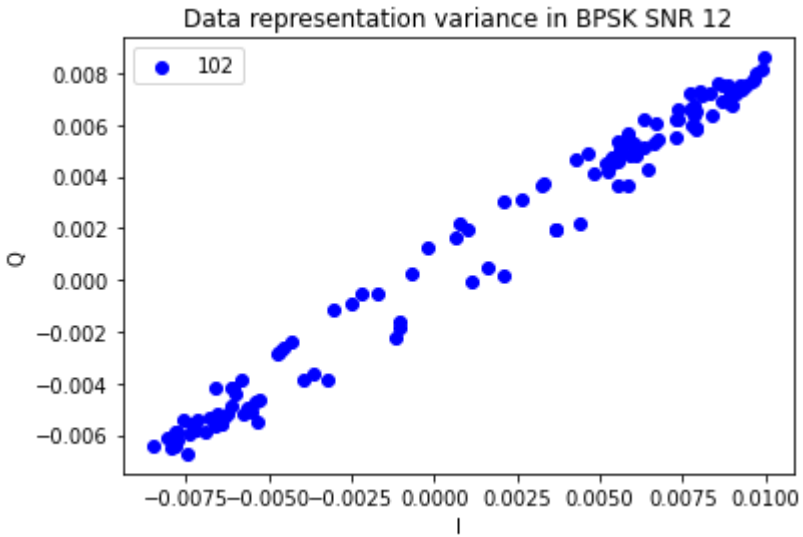

Data representation variance in BPSK SNR 12
97
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
I

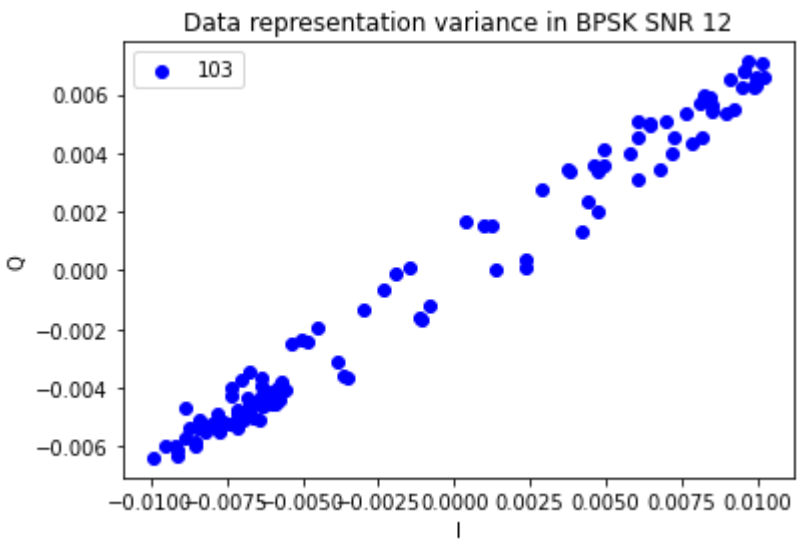

Data representation variance in BPSK SNR 12
98
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

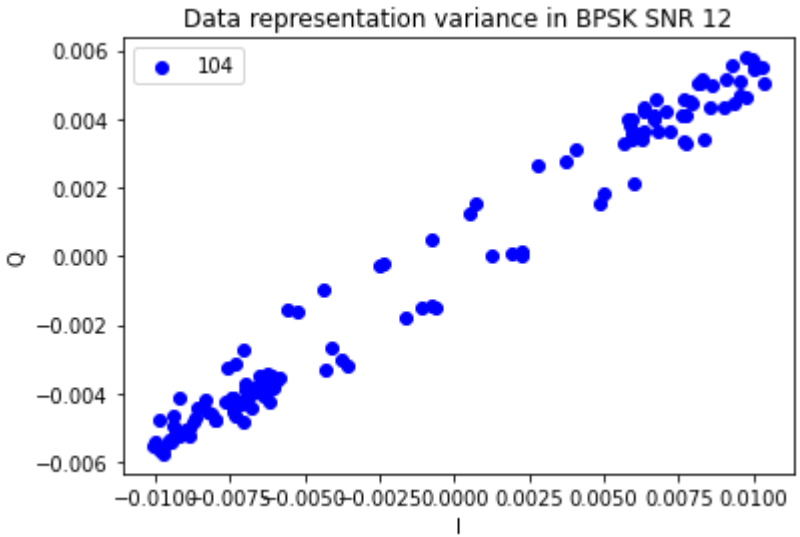

Data representation variance in BPSK SNR 12
99
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0100−0.0075−0.0050−0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

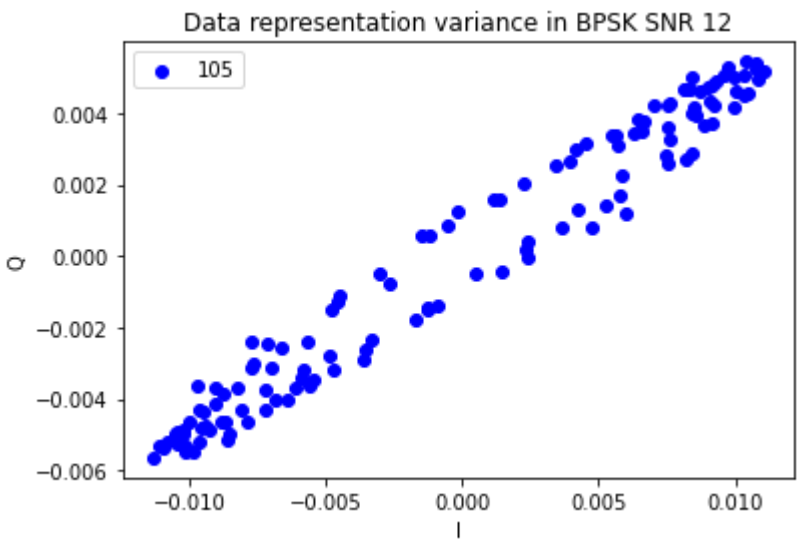

Data representation variance in BPSK SNR 12
100
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

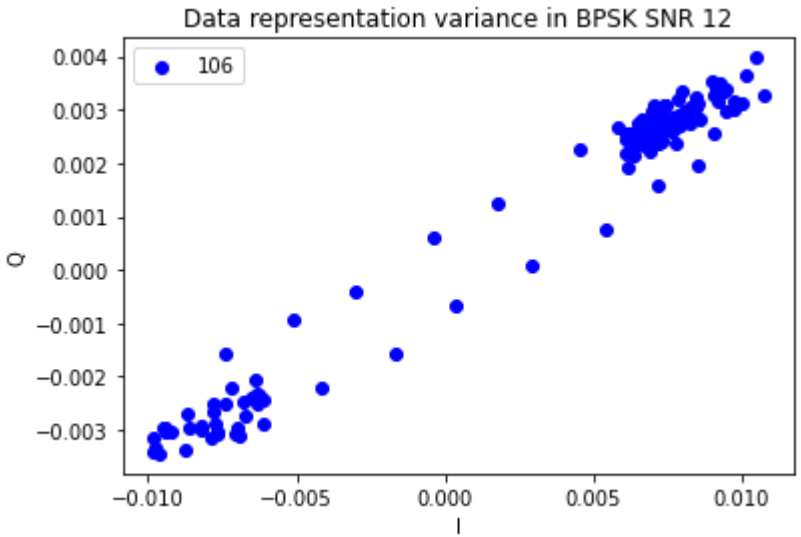

Data representation variance in BPSK SNR 12
101
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

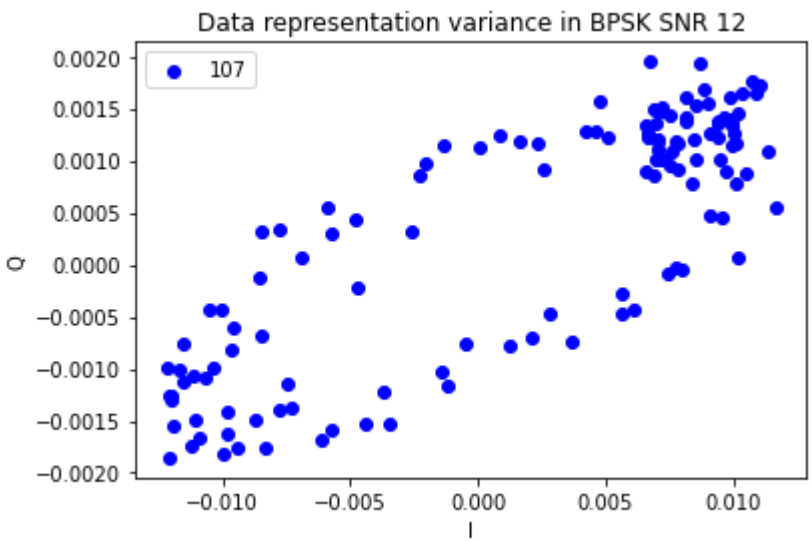

Data representation variance in BPSK SNR 12
102
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

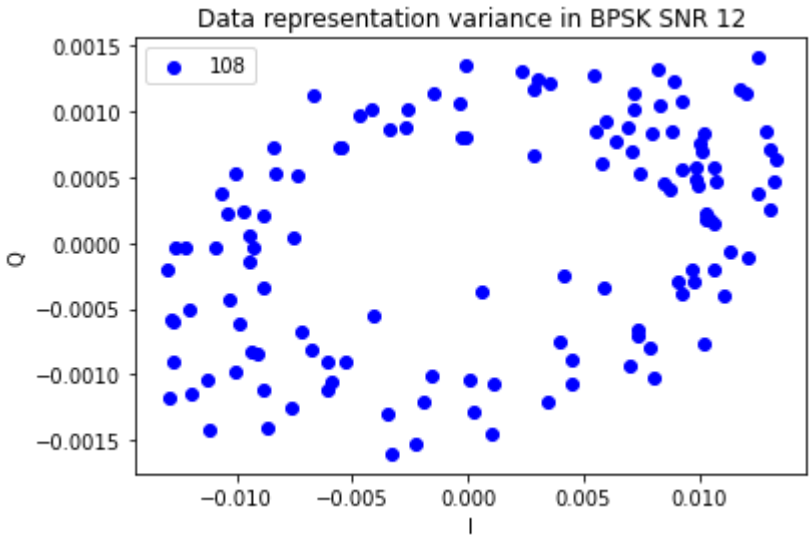

Data representation variance in BPSK SNR 12
103
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

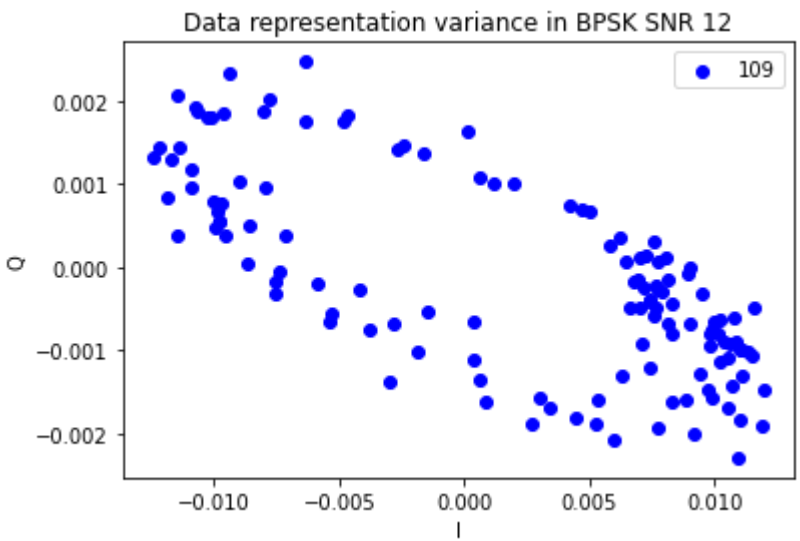

Data representation variance in BPSK SNR 12
104
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

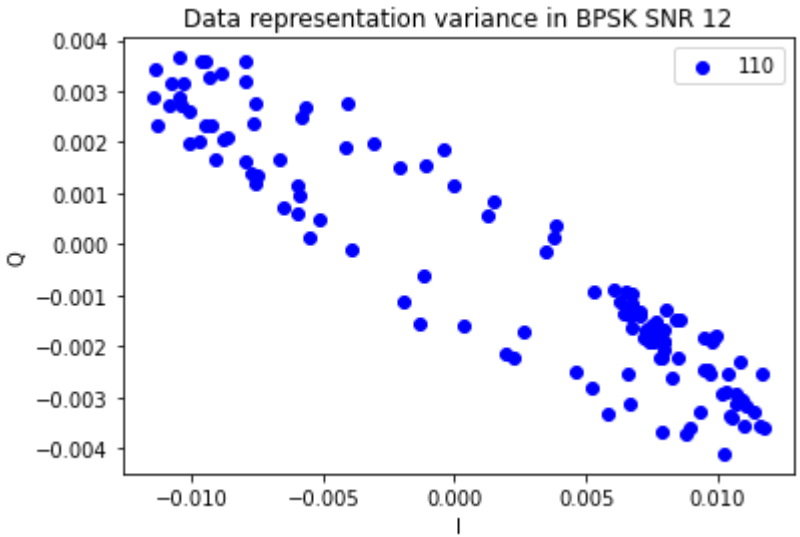

Data representation variance in BPSK SNR 12
105
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

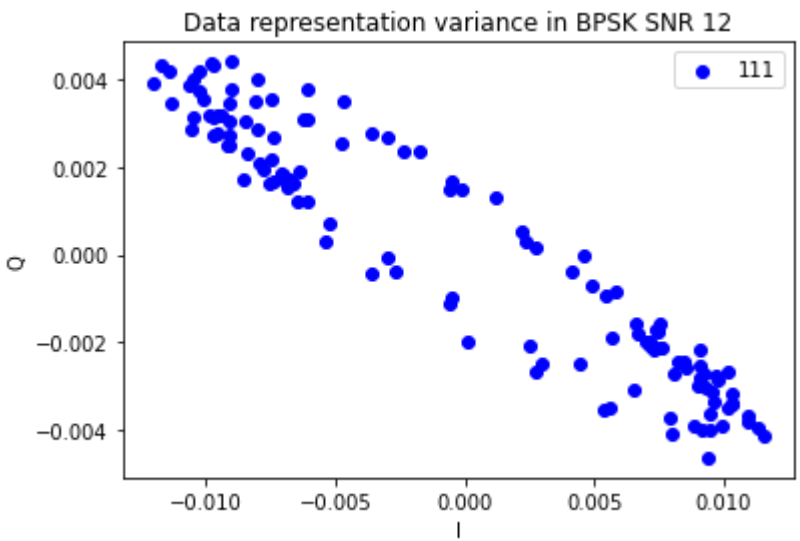

Data representation variance in BPSK SNR 12
106
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

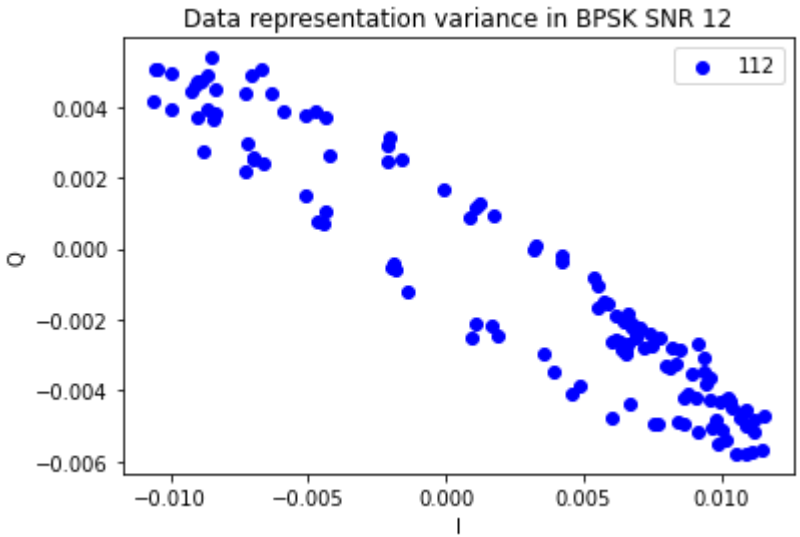

Data representation variance in BPSK SNR 12
107
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
−0.0020
Q
−0.010
−0.005
0.000
0.005
0.010
I

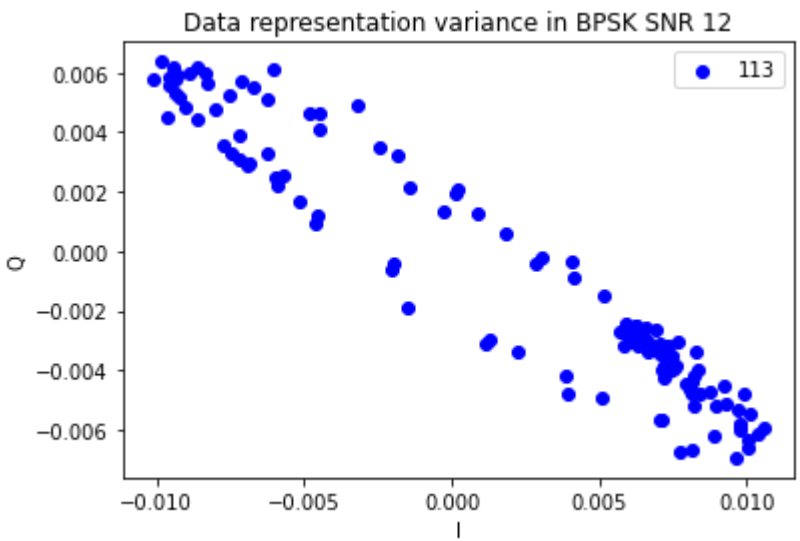

Data representation variance in BPSK SNR 12
108
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

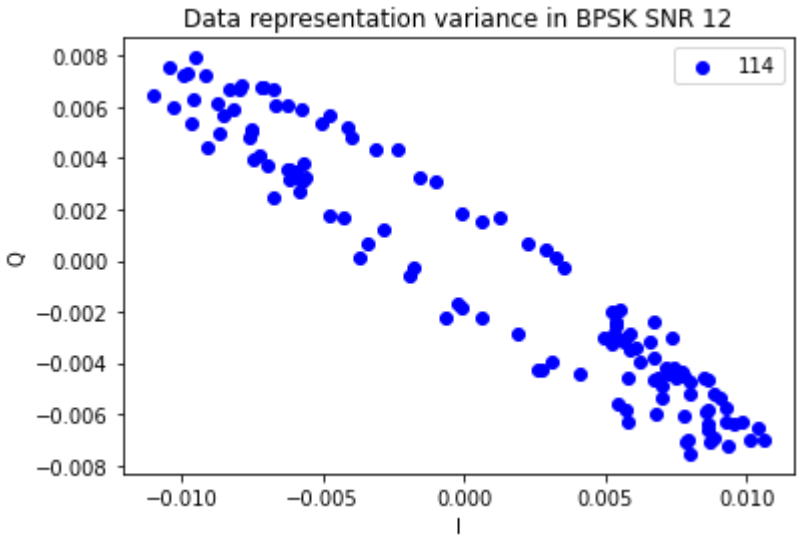

Data representation variance in BPSK SNR 12
109
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

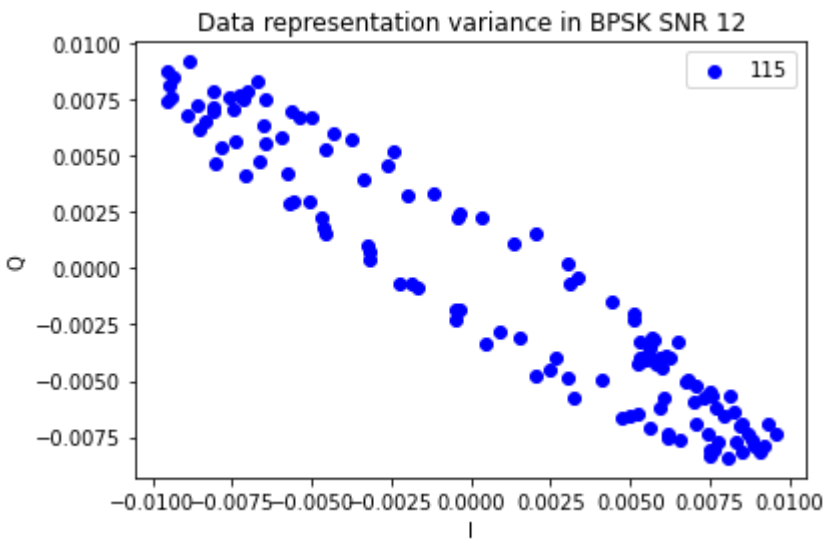

Data representation variance in BPSK SNR 12
110
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

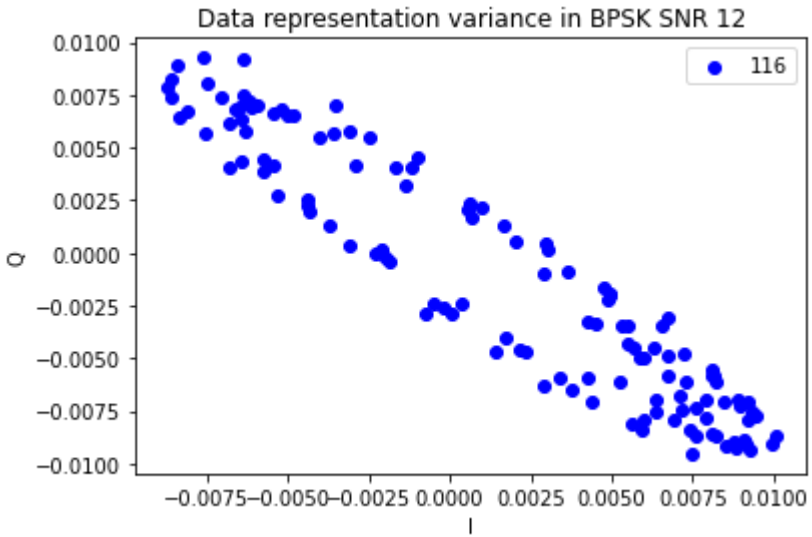

Data representation variance in BPSK SNR 12
111
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

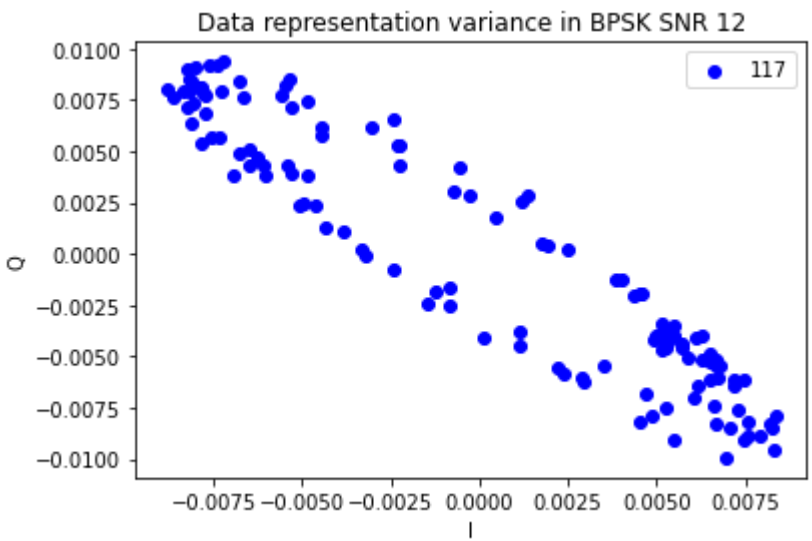

Data representation variance in BPSK SNR 12
112
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

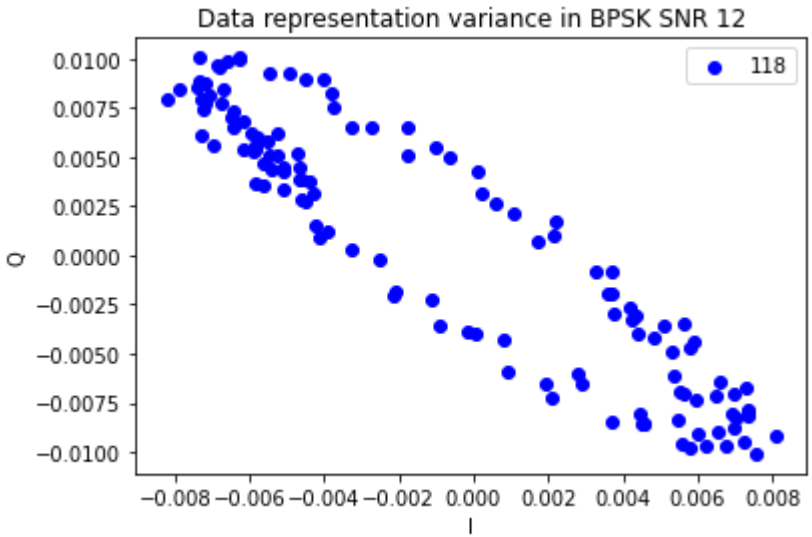

Data representation variance in BPSK SNR 12
113
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

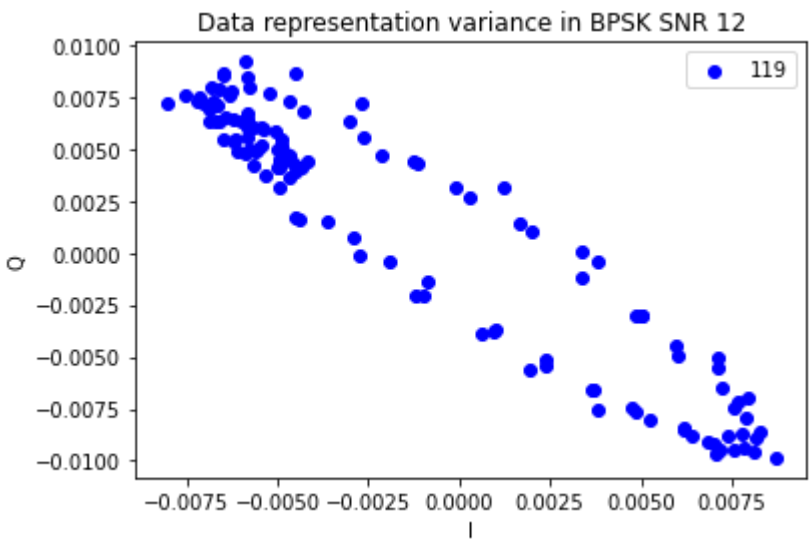

Data representation variance in BPSK SNR 12
114
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010
−0.005
0.000
0.005
0.010
I

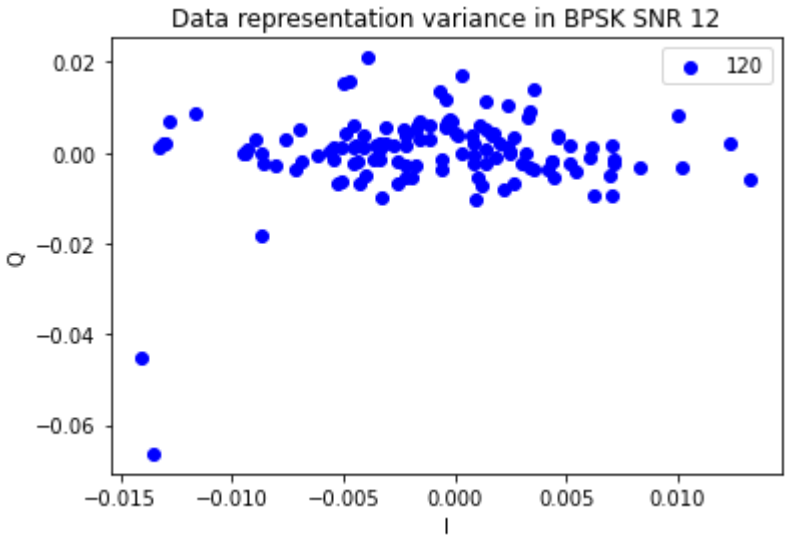

Data representation variance in BPSK SNR 12
115
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100
−0.0075
−0.0050
−0.0025
0.0000
0.0025
0.0050
0.0075
0.0100
I

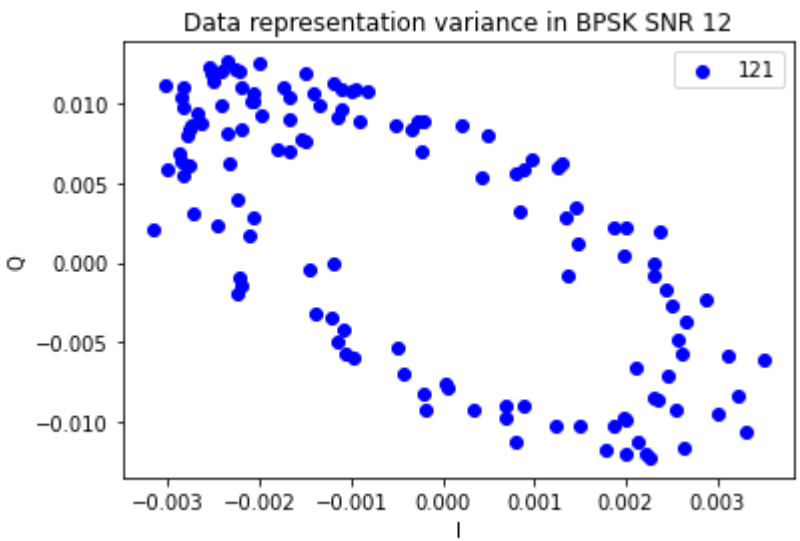

Data representation variance in BPSK SNR 12
116
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

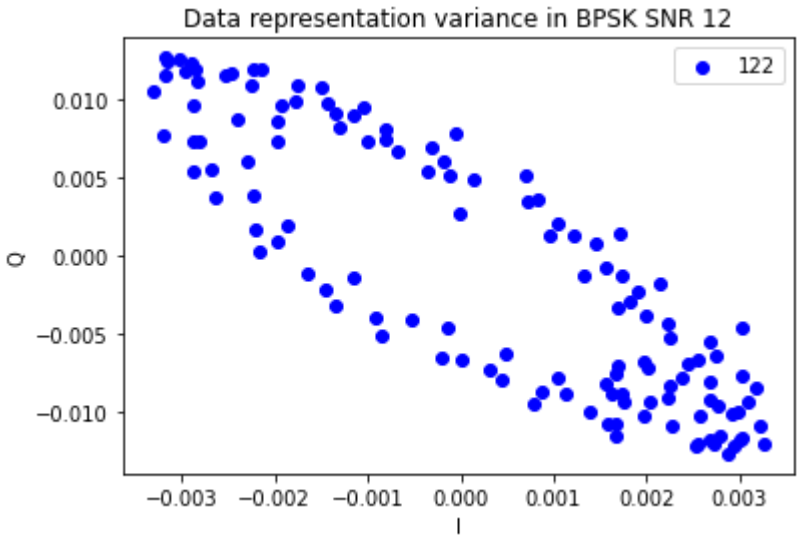

Data representation variance in BPSK SNR 12
117
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

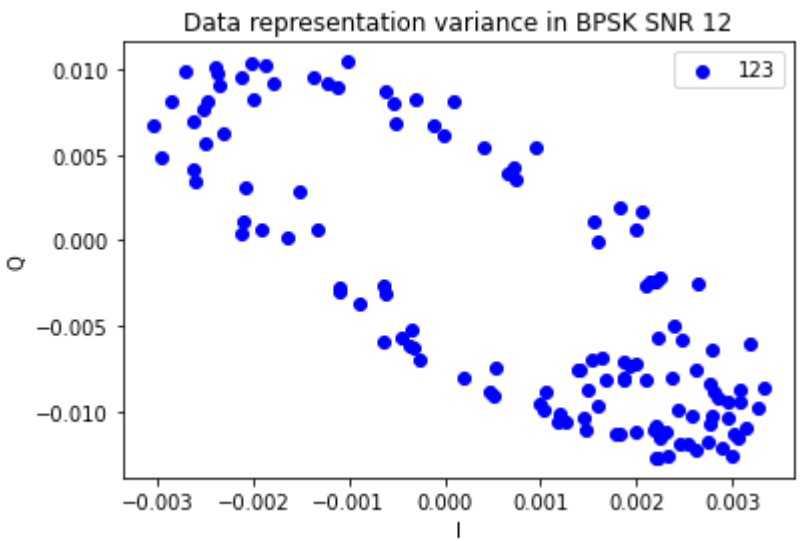

Data representation variance in BPSK SNR 12
118
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

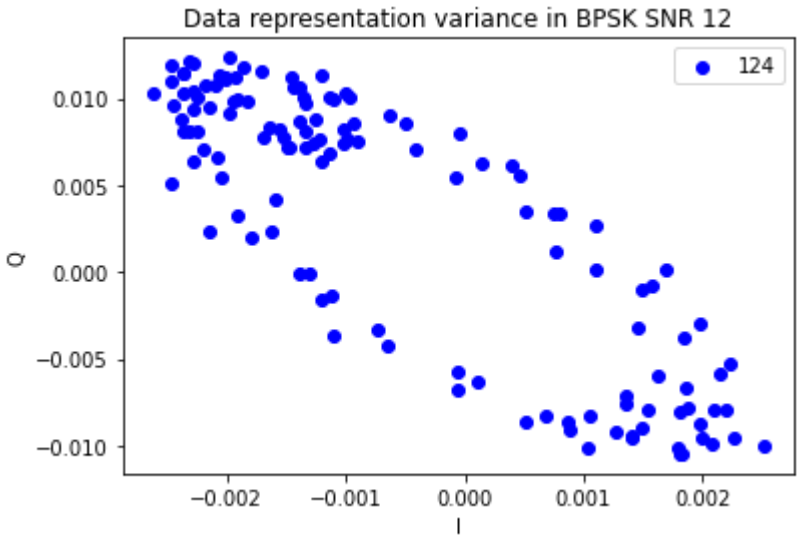

Data representation variance in BPSK SNR 12
119
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I

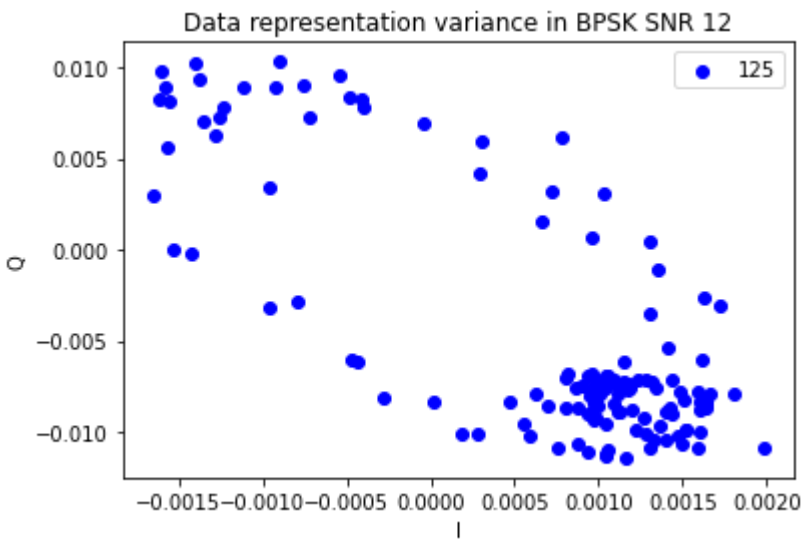

Data representation variance in BPSK SNR 12
120
0.02
0.00
−0.02
−0.04
−0.06
Q
−0.015
−0.010
−0.005
0.000
0.005
0.010
I

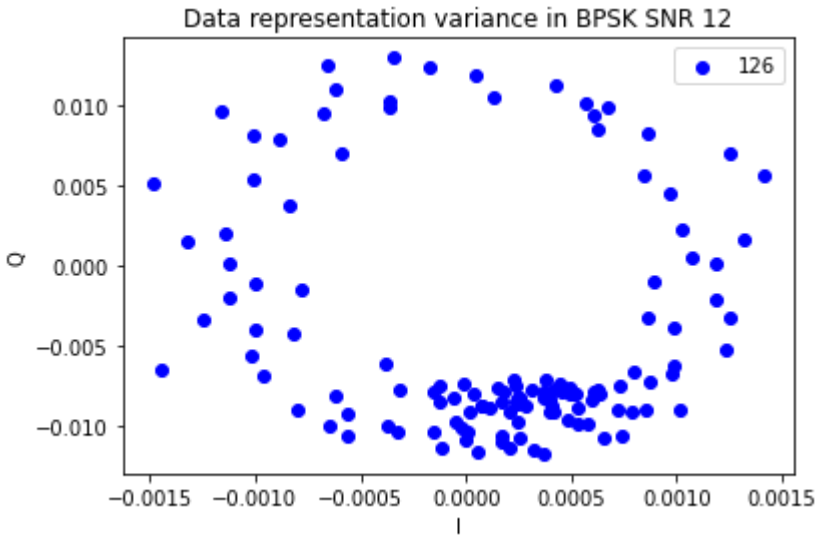

Data representation variance in BPSK SNR 12
121
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

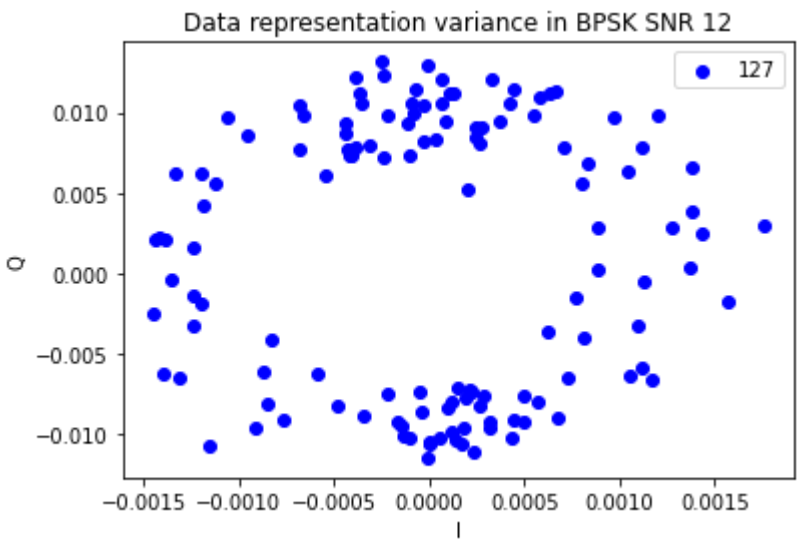

Data representation variance in BPSK SNR 12
122
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

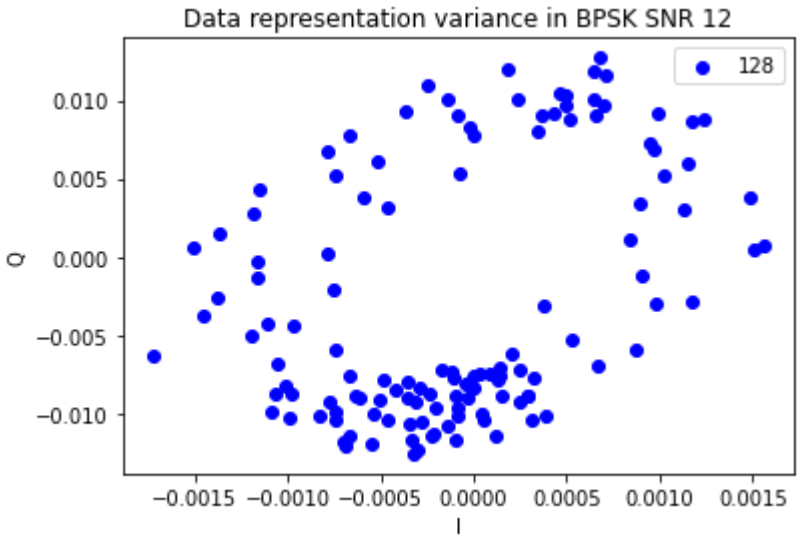

Data representation variance in BPSK SNR 12
123
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003
−0.002
−0.001
0.000
0.001
0.002
0.003
I

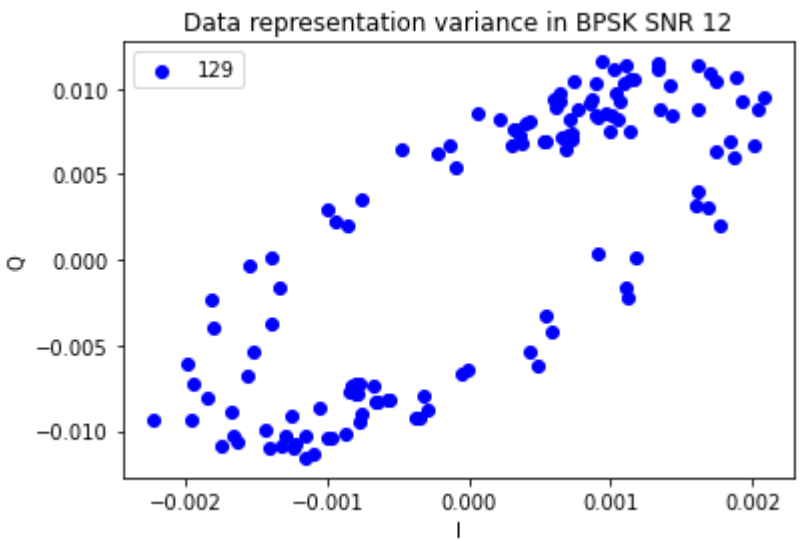

Data representation variance in BPSK SNR 12
124
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

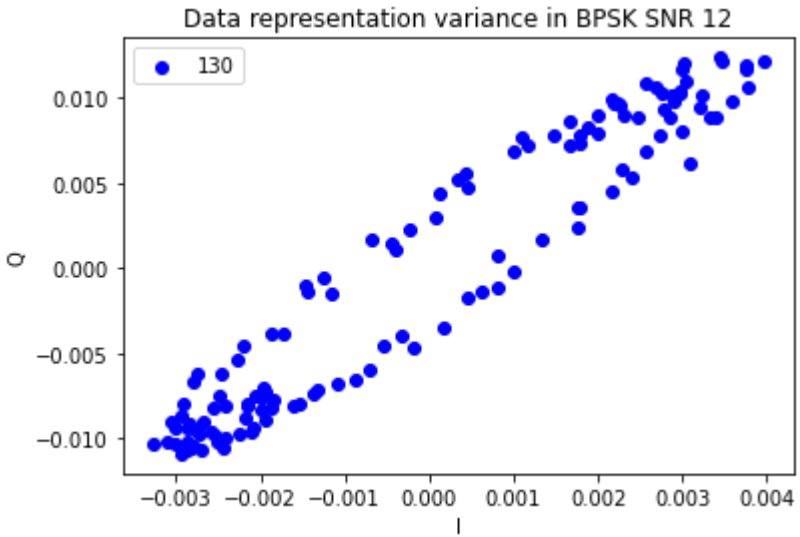

Data representation variance in BPSK SNR 12
125
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
I

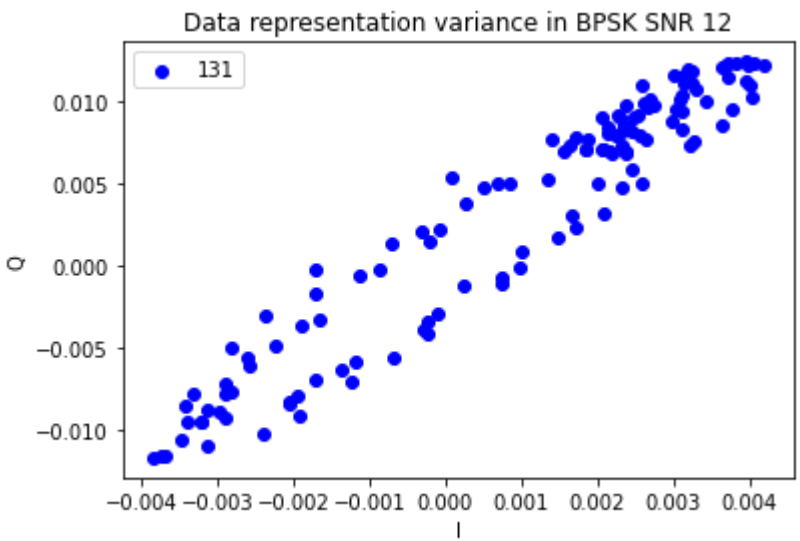

Data representation variance in BPSK SNR 12
126
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

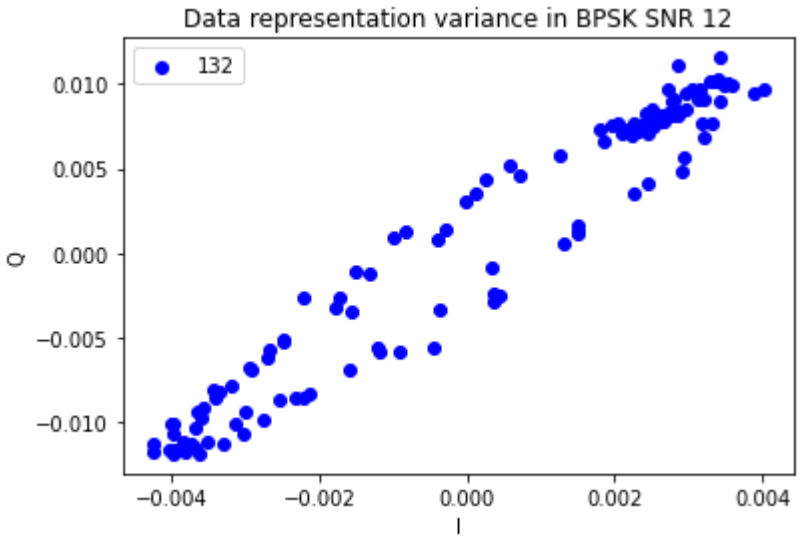

Data representation variance in BPSK SNR 12
127
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

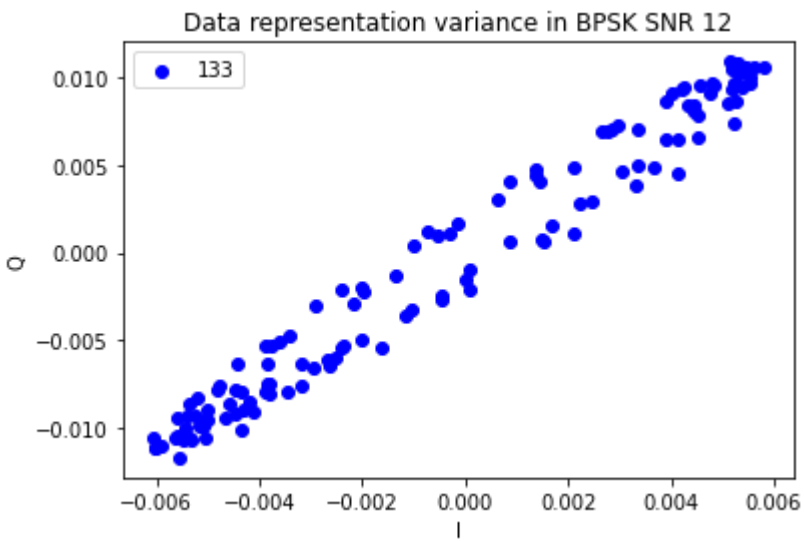

Data representation variance in BPSK SNR 12
128
0.010
0.005
0.000
−0.005
−0.010
Q
−0.0015
−0.0010
−0.0005
0.0000
0.0005
0.0010
0.0015
I

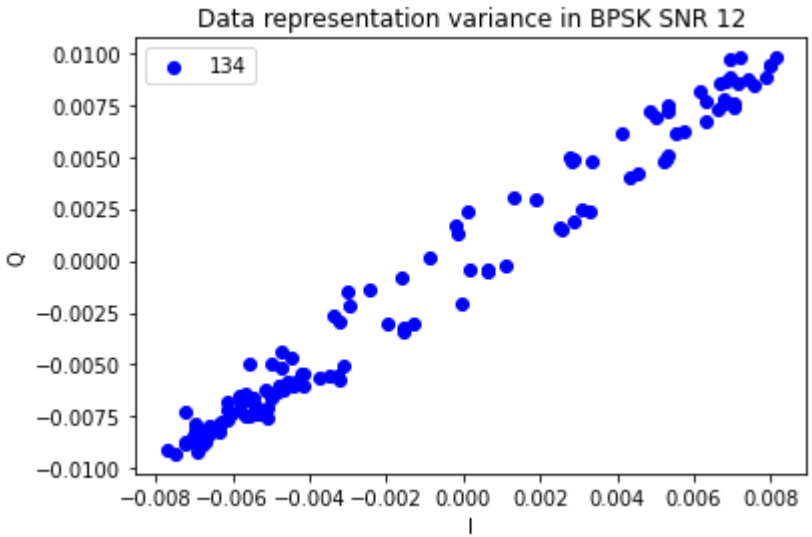

Data representation variance in BPSK SNR 12
129
0.010
0.005
0.000
−0.005
−0.010
Q
−0.002
−0.001
0.000
0.001
0.002
I

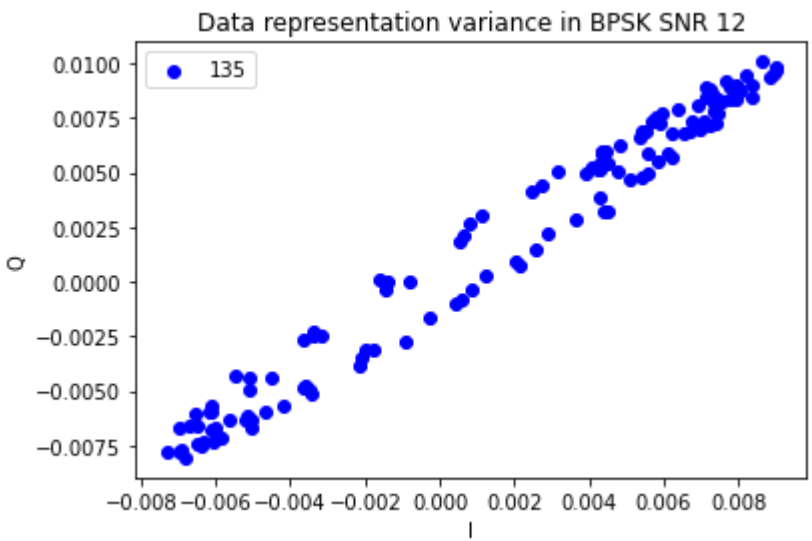

Data representation variance in BPSK SNR 12
130
0.010
0.005
0.000
−0.005
−0.010
Q
−0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

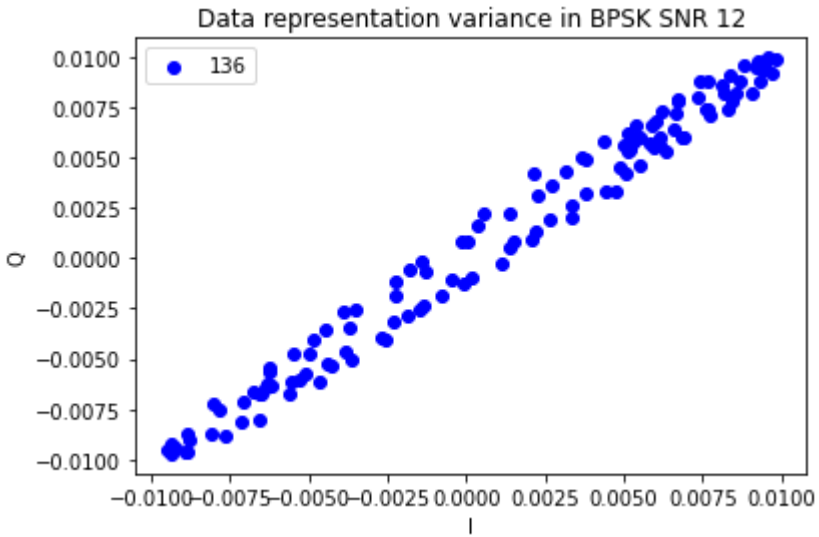

Data representation variance in BPSK SNR 12
131
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004 −0.003 −0.002 −0.001 0.000 0.001 0.002 0.003 0.004
I

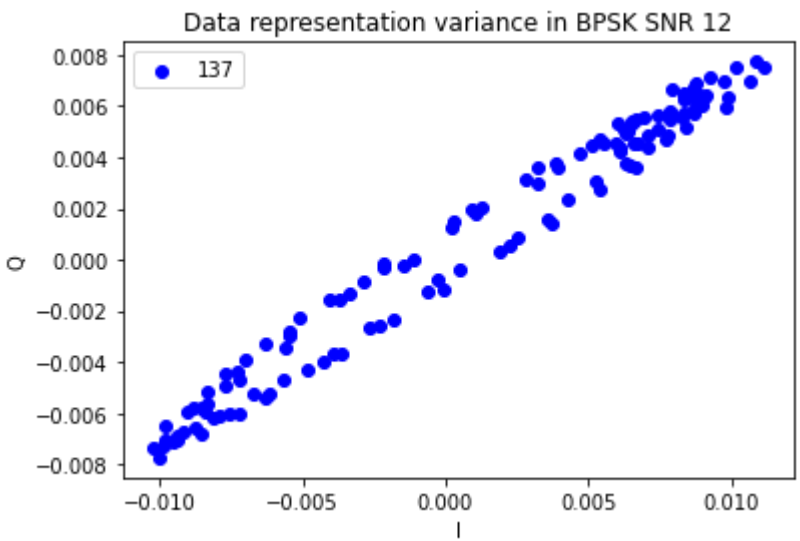

Data representation variance in BPSK SNR 12
132
0.010
0.005
0.000
−0.005
−0.010
Q
−0.004
−0.002
0.000
0.002
0.004
I

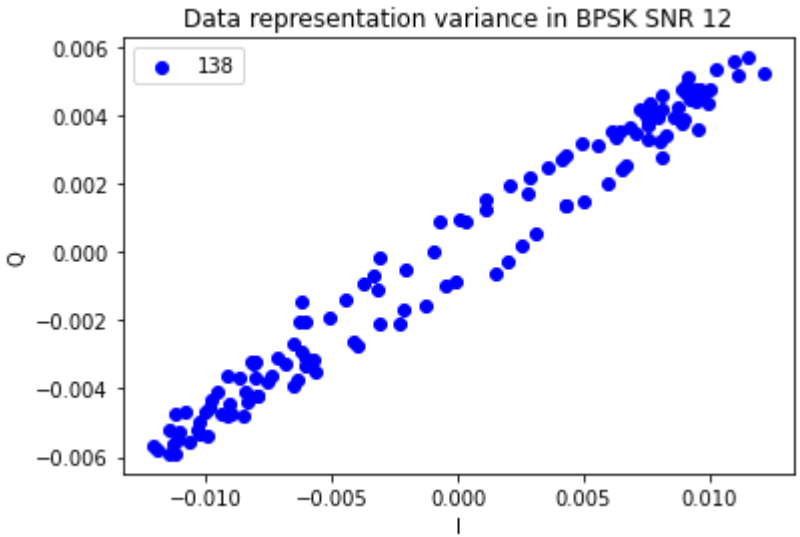

Data representation variance in BPSK SNR 12
133
0.010
0.005
0.000
−0.005
−0.010
Q
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
I

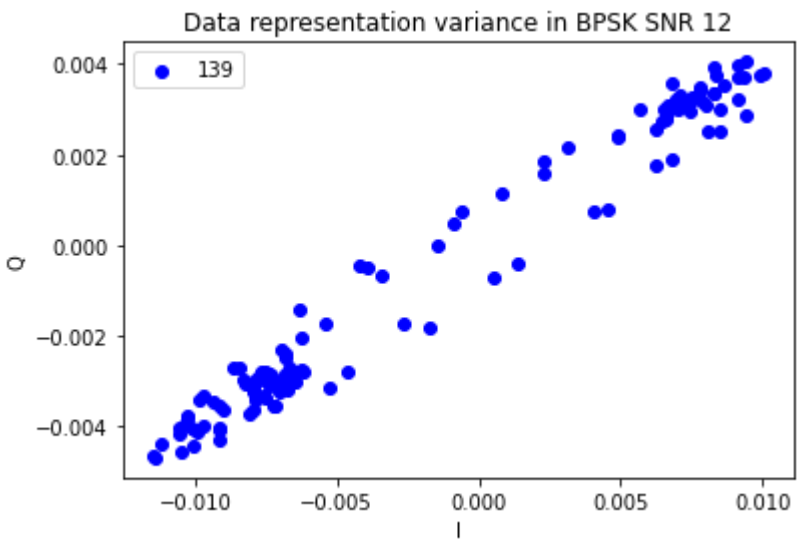

Data representation variance in BPSK SNR 12
134
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

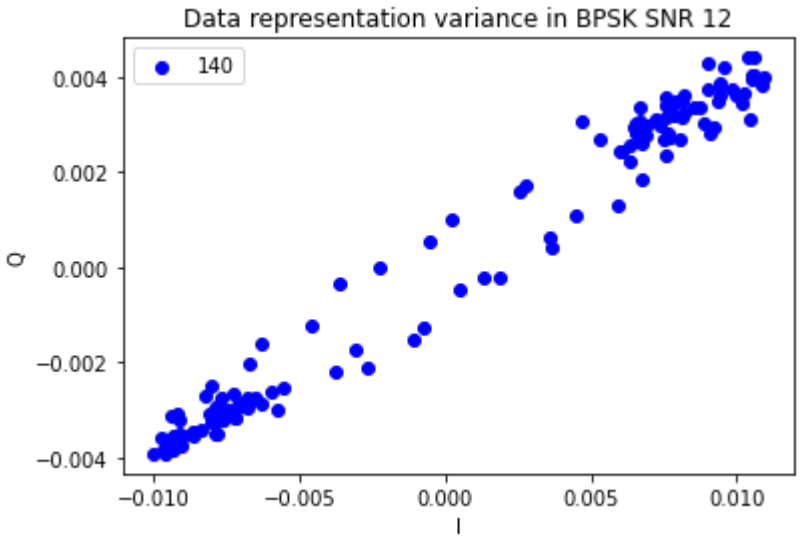

Data representation variance in BPSK SNR 12
135
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.008 −0.006 −0.004 −0.002 0.000 0.002 0.004 0.006 0.008
I

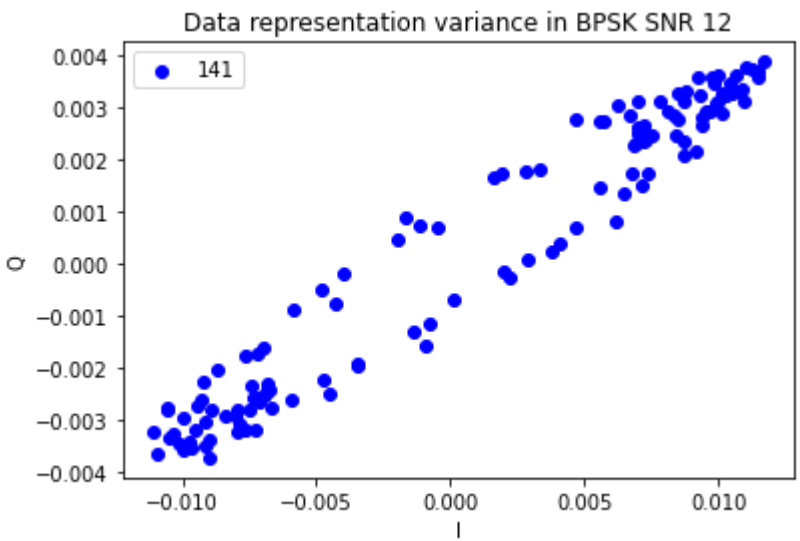

Data representation variance in BPSK SNR 12
136
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

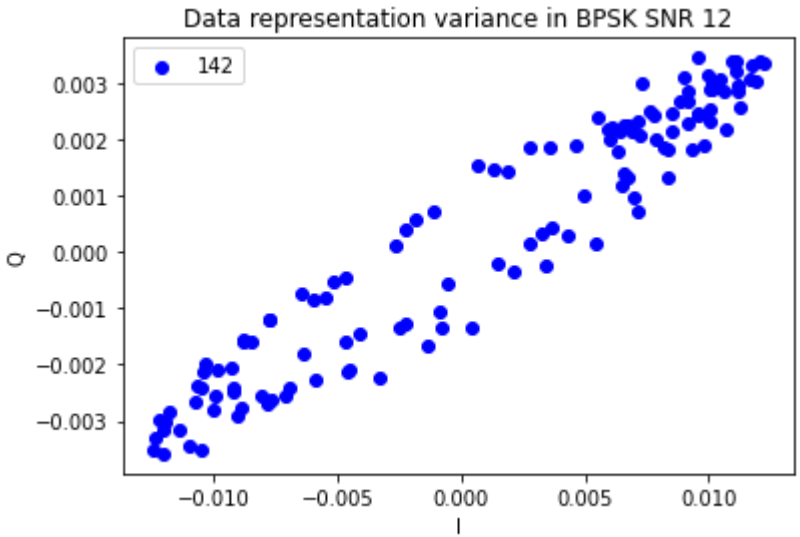

Data representation variance in BPSK SNR 12
137
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010 −0.005 0.000 0.005 0.010
I

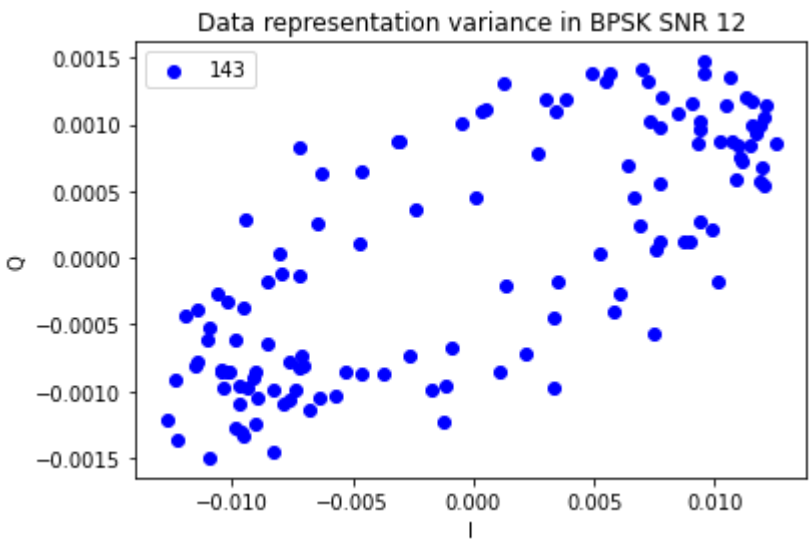

Data representation variance in BPSK SNR 12
138
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

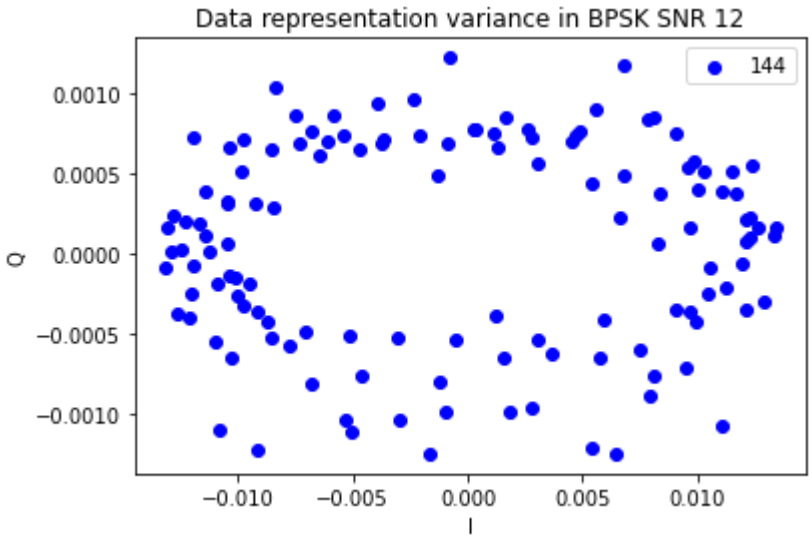

Data representation variance in BPSK SNR 12
139
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

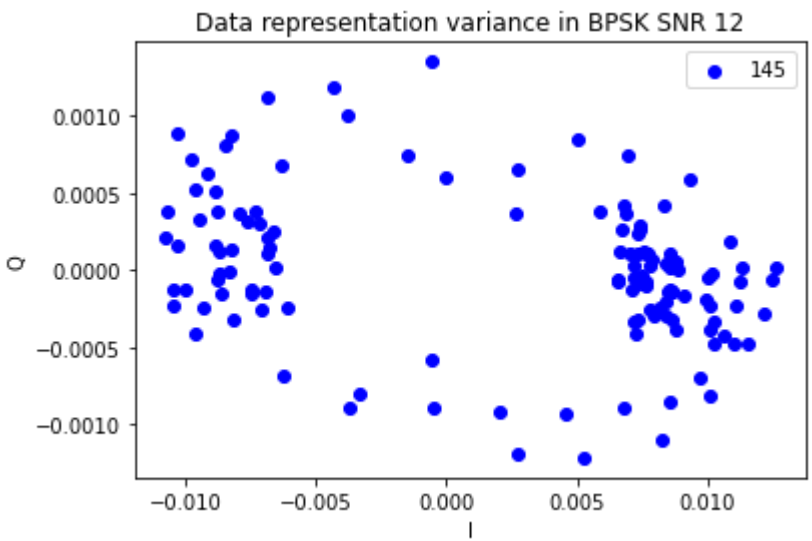

Data representation variance in BPSK SNR 12
140
0.004
0.002
0.000
−0.002
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

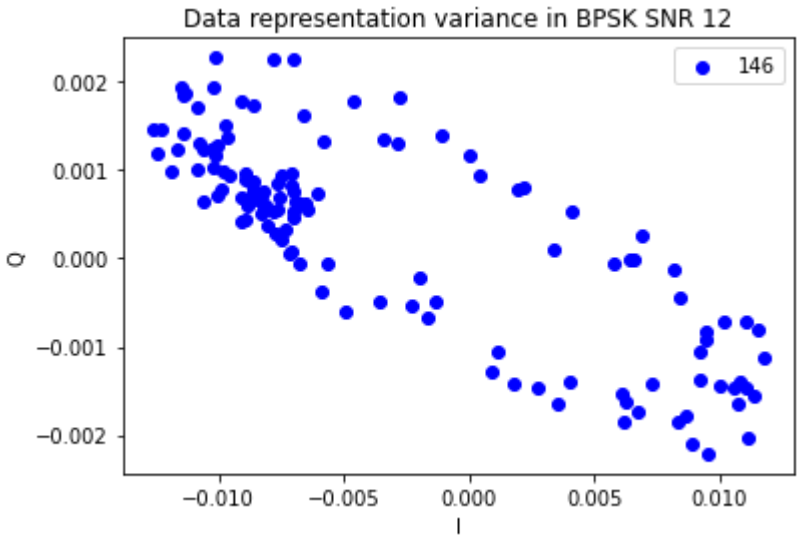

Data representation variance in BPSK SNR 12
141
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

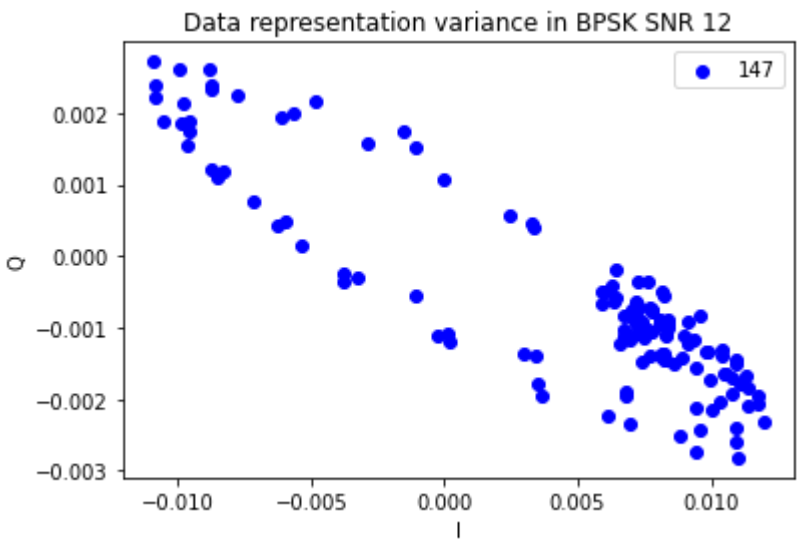

Data representation variance in BPSK SNR 12
142
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

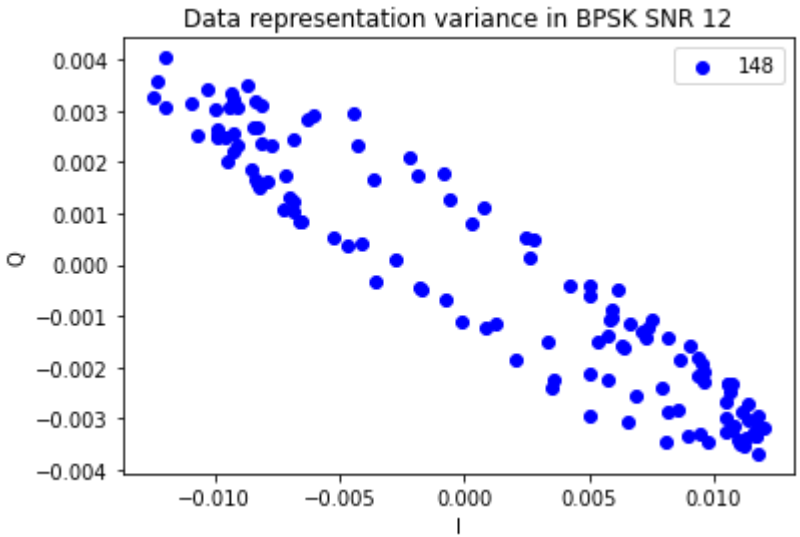

Data representation variance in BPSK SNR 12
143
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
−0.0015
Q
−0.010
−0.005
0.000
0.005
0.010
I

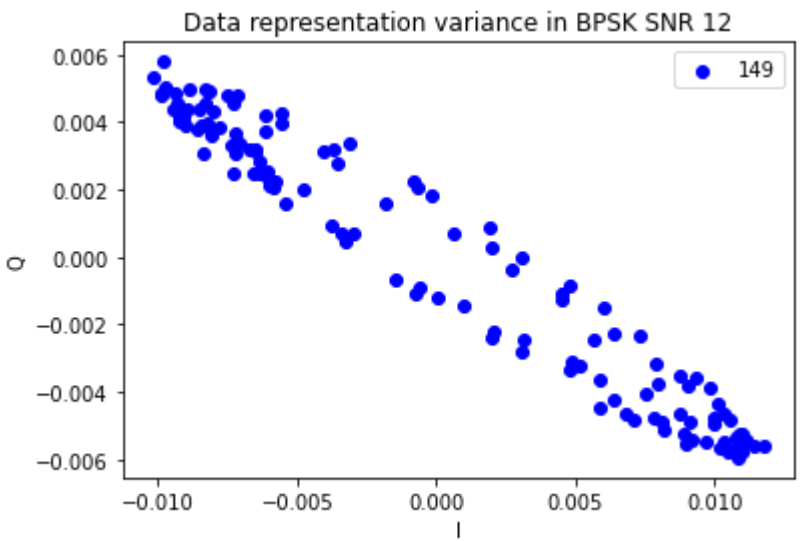

Data representation variance in BPSK SNR 12
144
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

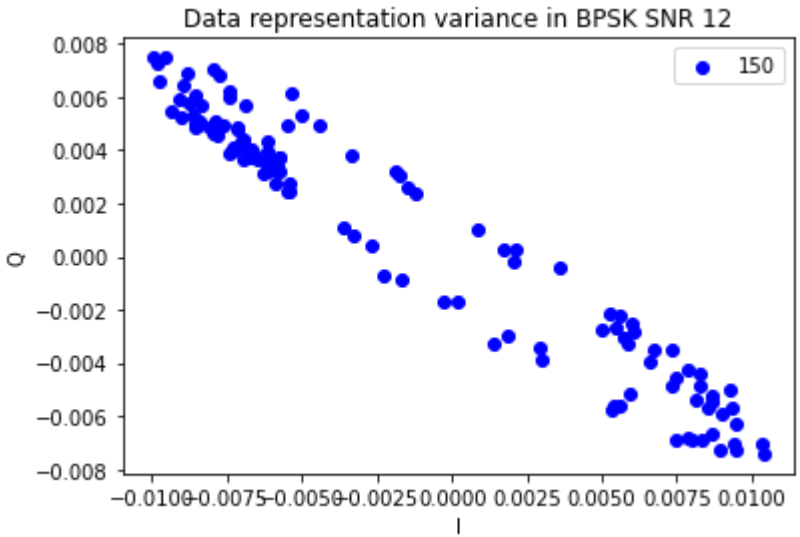

Data representation variance in BPSK SNR 12
145
0.0010
0.0005
0.0000
−0.0005
−0.0010
Q
−0.010
−0.005
0.000
0.005
0.010
I

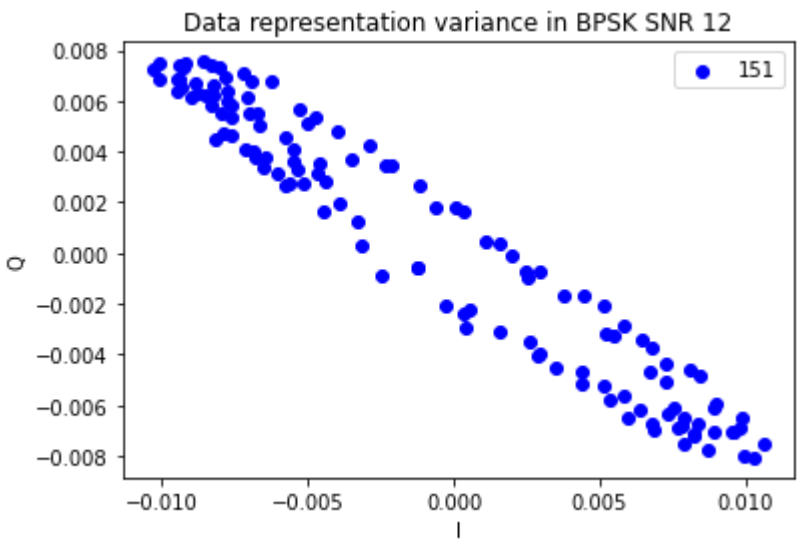

Data representation variance in BPSK SNR 12
146
0.002
0.001
0.000
−0.001
−0.002
Q
−0.010
−0.005
0.000
0.005
0.010
I

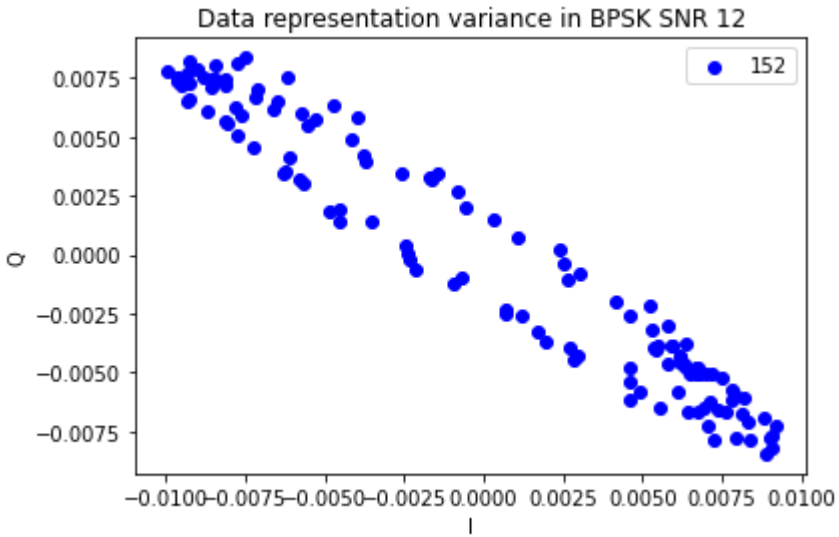

Data representation variance in BPSK SNR 12
147
0.002
0.001
0.000
−0.001
−0.002
−0.003
Q
−0.010
−0.005
0.000
0.005
0.010
I

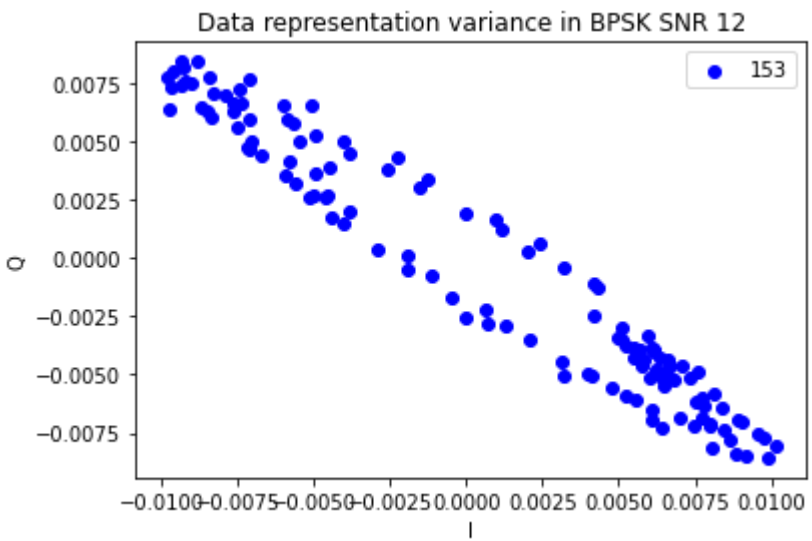

Data representation variance in BPSK SNR 12
148
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
Q
−0.010
−0.005
0.000
0.005
0.010
I

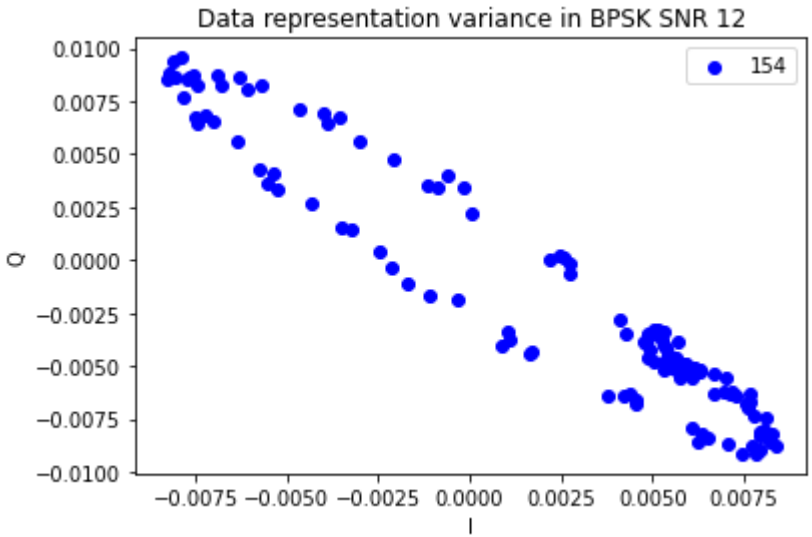

Data representation variance in BPSK SNR 12
149
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
Q
−0.010
−0.005
0.000
0.005
0.010
I

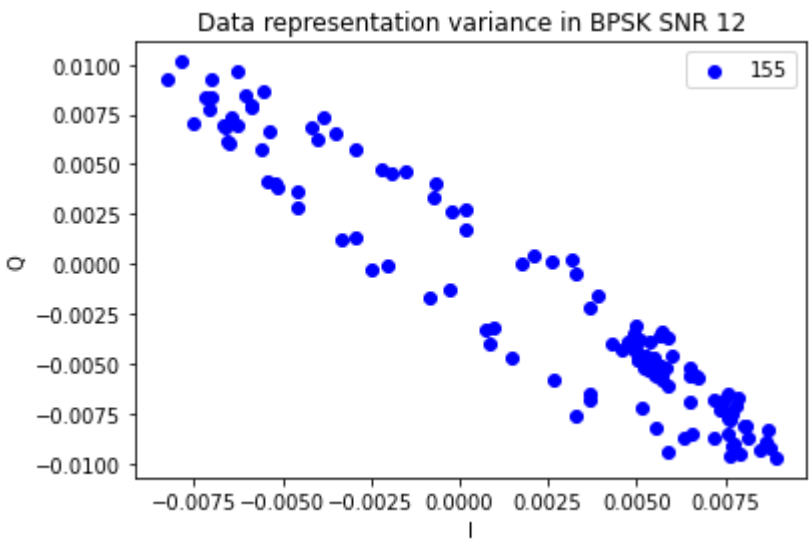

Data representation variance in BPSK SNR 12
150
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

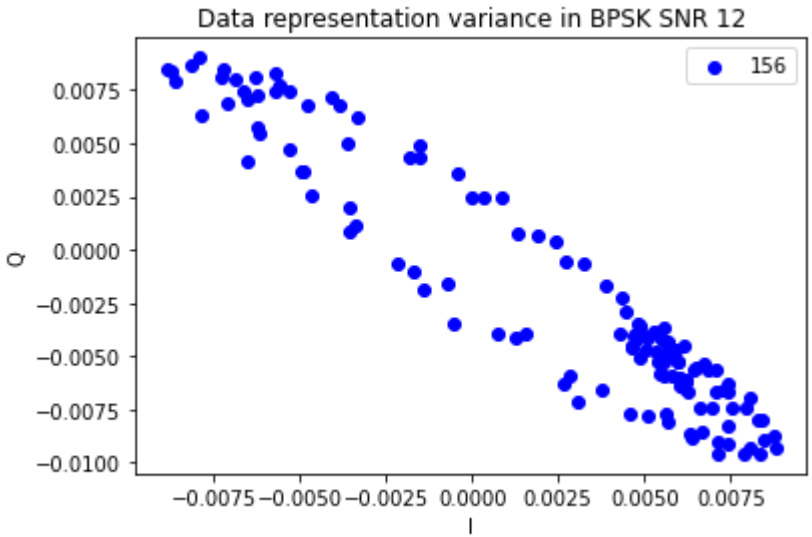

Data representation variance in BPSK SNR 12
151
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
Q
−0.010 −0.005 0.000 0.005 0.010
I

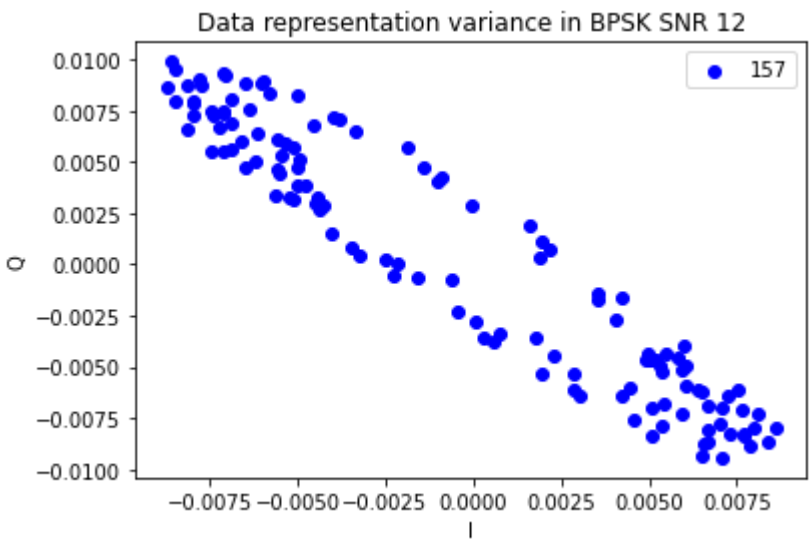

Data representation variance in BPSK SNR 12
152
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I

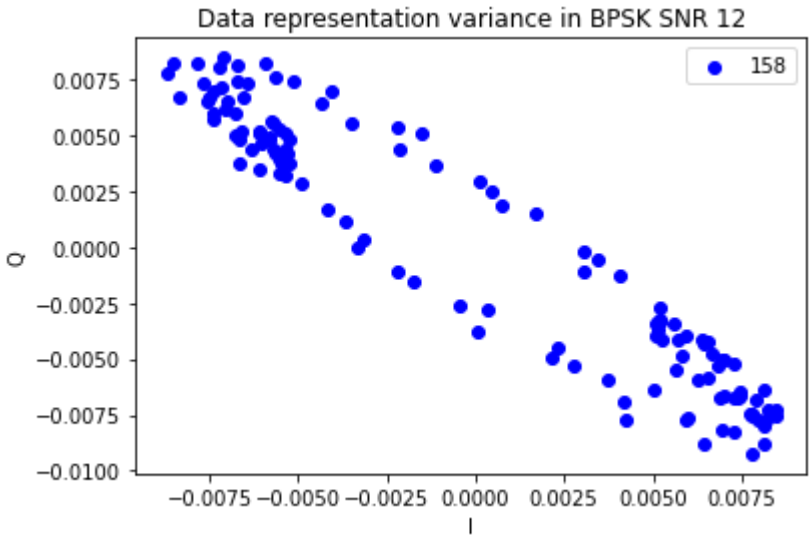

Data representation variance in BPSK SNR 12
153
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
Q
−0.0100 −0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075 0.0100
I


Data representation variance in BPSK SNR 12
154
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
155
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
156
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
157
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I


Data representation variance in BPSK SNR 12
158
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
−0.0100
Q
−0.0075 −0.0050 −0.0025 0.0000 0.0025 0.0050 0.0075
I