Machine Learning Models

Layer (type)	Output Shape	Param #	Connected to
input_17 (InputLayer)	[(None, 192)]	0	[]
dense_64 (Dense)	(None, 96)	18528	['input_17[0][0]']
dense_65 (Dense)	(None, 48)	4656	['dense_64[0][0]']
dense_66 (Dense)	(None, 24)	1176	['dense_65[0][0]']
dense_67 (Dense)	(None, 12)	300	['dense_66[0][0]']
xy (Dense)	(None, 2)	26	['dense_67[0][0]']
theta (Dense)	(None, 1)	13	['dense_67[0][0]']

Total params: 24,699
Trainable params: 24,699
Non-trainable params: 0

Model 1

Layer (type)	Output Shape	Param #	Connected to
input_21 (InputLayer)	[(None, 192)]	0	[]
dense_81 (Dense)	(None, 256)	49408	['input_21[0][0]']
dense_82 (Dense)	(None, 128)	32896	['dense_81[0][0]']
dense_83 (Dense)	(None, 64)	8256	['dense_82[0][0]']
dense_84 (Dense)	(None, 32)	2080	['dense_83[0][0]']
dense_85 (Dense)	(None, 24)	792	['dense_84[0][0]']
dense_86 (Dense)	(None, 12)	300	['dense_85[0][0]']
xy (Dense)	(None, 2)	26	['dense_86[0][0]']
theta (Dense)	(None, 1)	13	['dense_86[0][0]']

Total params: 93,771
Trainable params: 93,771
Non-trainable params: 0

Model 3

Model: "model_22"

Layer (type)	Output Shape	Param #	Connected to
input_23 (InputLayer)	[(None, 192)]	0	[]
dense_93 (Dense)	(None, 400)	77200	['input_23[0][0]']
dense_94 (Dense)	(None, 200)	80200	['dense_93[0][0]']
dense_95 (Dense)	(None, 100)	20100	['dense_94[0][0]']
dense_96 (Dense)	(None, 50)	5050	['dense_95[0][0]']
dense_97 (Dense)	(None, 25)	1275	['dense_96[0][0]']
dense_98 (Dense)	(None, 12)	312	['dense_97[0][0]']
xy (Dense)	(None, 2)	26	['dense_98[0][0]']
theta (Dense)	(None, 1)	13	['dense_98[0][0]']

Total params: 184,176
Trainable params: 184,176
Non-trainable params: 0

Model 5

Layer (type)	Output Shape	Param #	Connected to
input_18 (InputLayer)	[(None, 192)]	0	[]
dense_68 (Dense)	(None, 192)	37056	['input_18[0][0]']
dense_69 (Dense)	(None, 96)	18528	['dense_68[0][0]']
dense_70 (Dense)	(None, 48)	4656	['dense_69[0][0]']
dense_71 (Dense)	(None, 24)	1176	['dense_70[0][0]']
dense_72 (Dense)	(None, 12)	300	['dense_71[0][0]']
xy (Dense)	(None, 2)	26	['dense_72[0][0]']
theta (Dense)	(None, 1)	13	['dense_72[0][0]']

Total params: 61,755
Trainable params: 61,755
Non-trainable params: 0

Model 2

Layer (type)	Output Shape	Param #	Connected to
input_22 (InputLayer)	[(None, 192)]	0	[]
dense_87 (Dense)	(None, 320)	61760	['input_22[0][0]']
dense_88 (Dense)	(None, 160)	51360	['dense_87[0][0]']
dense_89 (Dense)	(None, 80)	12880	['dense_88[0][0]']
dense_90 (Dense)	(None, 40)	3240	['dense_89[0][0]']
dense_91 (Dense)	(None, 20)	820	['dense_90[0][0]']
dense_92 (Dense)	(None, 12)	252	['dense_91[0][0]']
xy (Dense)	(None, 2)	26	['dense_92[0][0]']
theta (Dense)	(None, 1)	13	['dense_92[0][0]']

Total params: 130,351
Trainable params: 130,351
Non-trainable params: 0

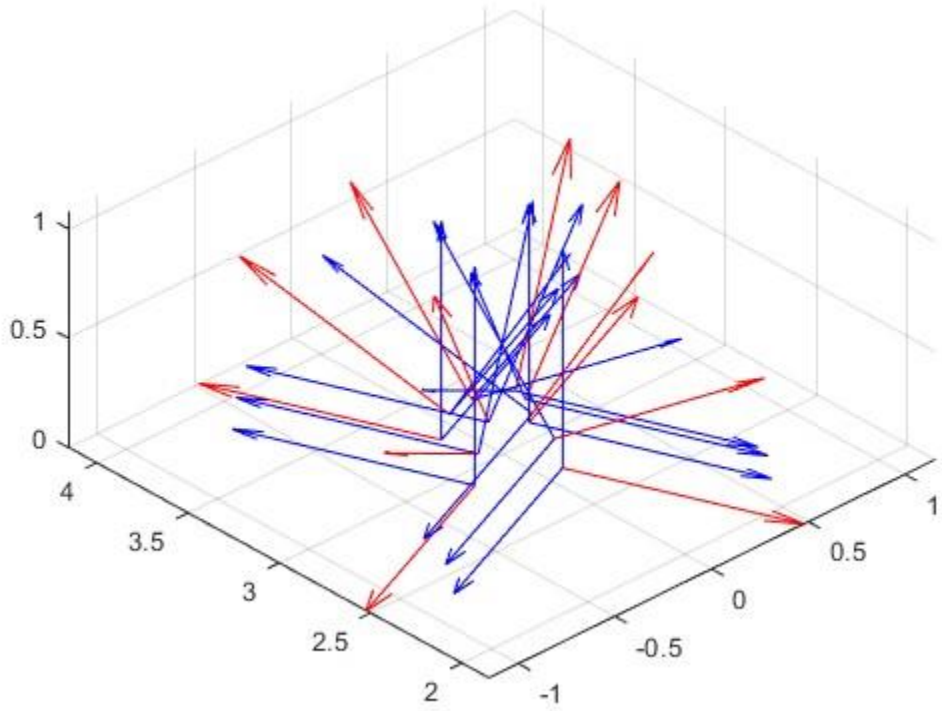
Model 4

Layer (type)	Output Shape	Param #	Connected to
input_24 (InputLayer)	[(None, 192)]	0	[]
dense_99 (Dense)	(None, 480)	92640	['input_24[0][0]']
dense_100 (Dense)	(None, 240)	115440	['dense_99[0][0]']
dense_101 (Dense)	(None, 120)	28920	['dense_100[0][0]']
dense_102 (Dense)	(None, 60)	7260	['dense_101[0][0]']
dense_103 (Dense)	(None, 30)	1830	['dense_102[0][0]']
dense_104 (Dense)	(None, 12)	372	['dense_103[0][0]']
xy (Dense)	(None, 2)	26	['dense_104[0][0]']
theta (Dense)	(None, 1)	13	['dense_104[0][0]']

Total params: 246,501
Trainable params: 246,501
Non-trainable params: 0

Model 6

12 Sensors

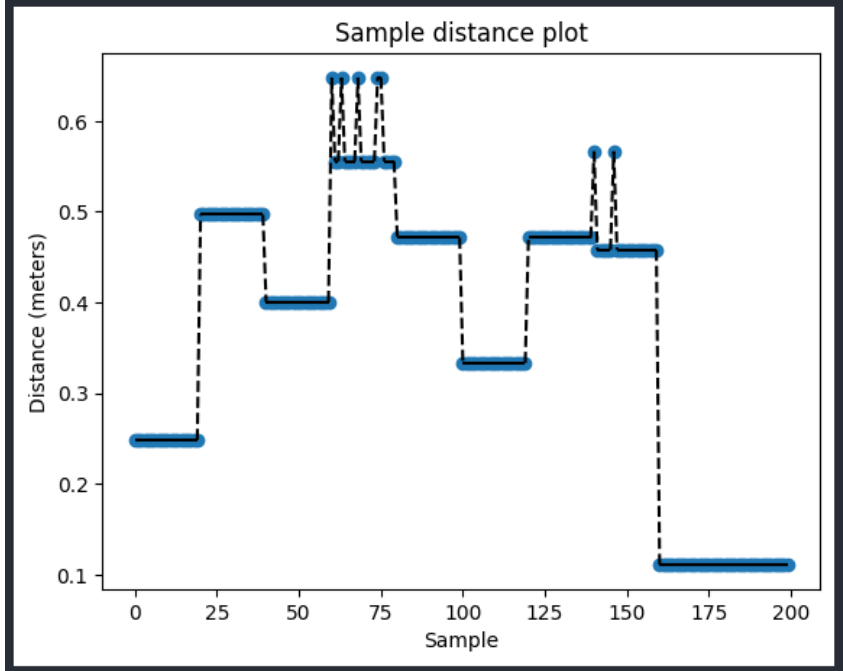


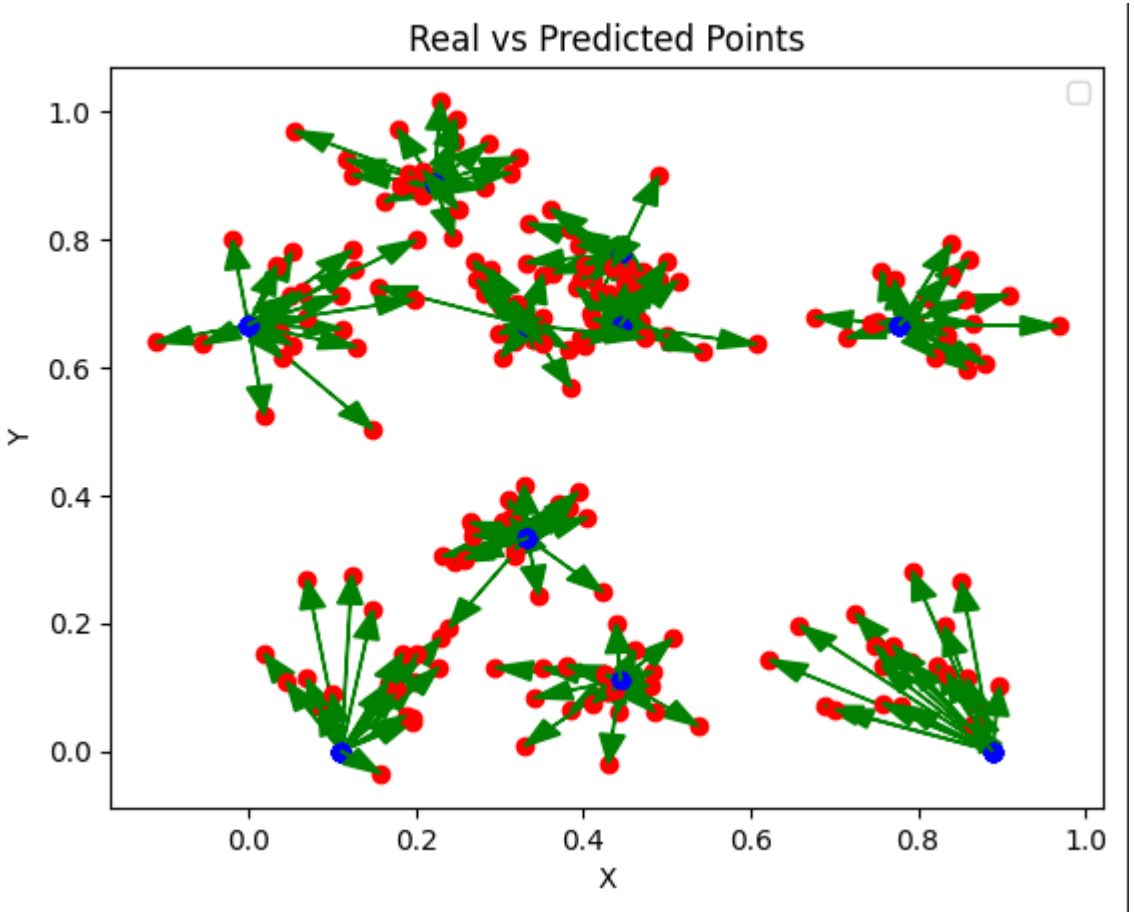
12 Sensors

Model 1

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1107 - xy_loss: 0.0965 - theta_loss: 0.1249 - xy_xy_metric: 0.0987 - theta_theta_metric: 0.1298
Mean Squared Error:  [0.11073926836252213, 0.09654903411865234, 0.1249295026063919, 0.09874577820301056, 0.1298452317714691 2]
13/13 [==============================] - 0s 2ms/step - loss: 0.1091 - xy_loss: 0.0952 - theta_loss: 0.1230 - xy_xy_metric: 0.0984 - theta_theta_metric: 0.1267
Mean Squared Error:  [0.10910174995660782, 0.09518541395664215, 0.12301808595657349, 0.09844433516263962, 0.12669073045253754]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.28344224486275704 meters
Mean squared error for test data (degrees):  0.23921166824012258 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3691941285592044, shape=(), dtype=float64) meters
```



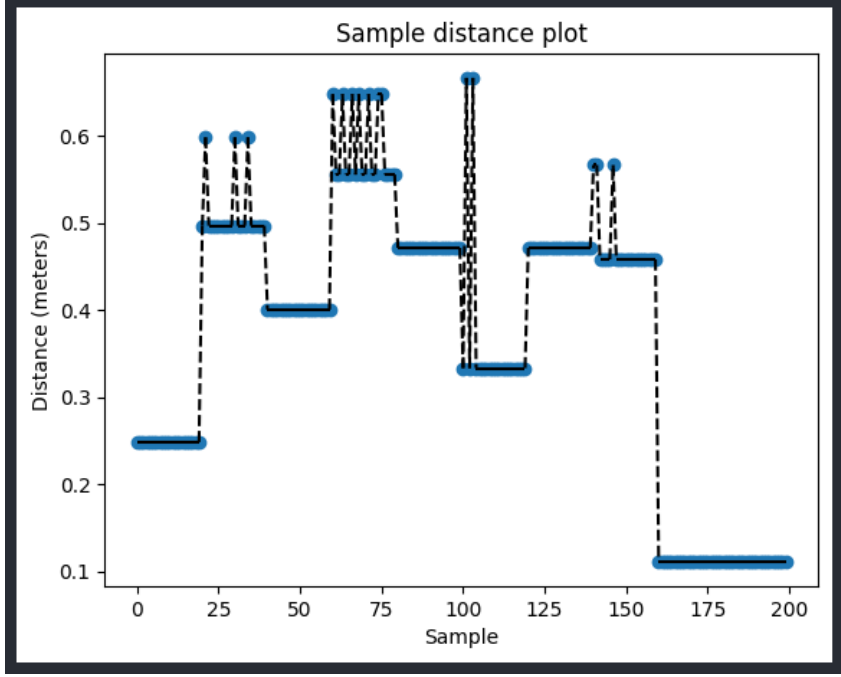


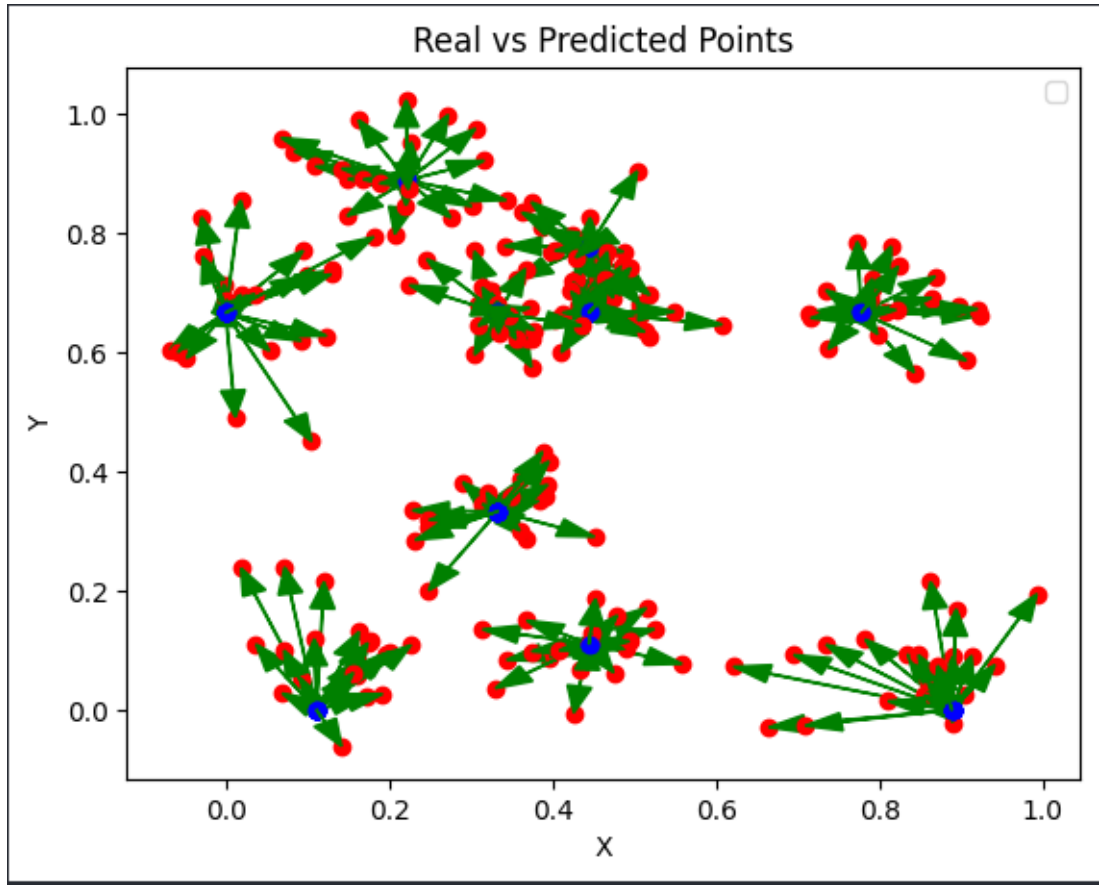
12 Sensors

Model 2

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1129 - xy_loss: 0.0899 - theta_loss: 0.1360 - xy_xy_metric: 0.0911 - theta_theta_metric: 0.1313
Mean Squared Error:  [0.11294282972812653, 0.08989287167787552, 0.13599278032779694, 0.09109801799058914, 0.13125789165496826]
13/13 [==============================] - 0s 2ms/step - loss: 0.1141 - xy_loss: 0.0888 - theta_loss: 0.1395 - xy_xy_metric: 0.0904 - theta_theta_metric: 0.1433
Mean Squared Error:  [0.1141292005777359, 0.08879447728395462, 0.13946393132209778, 0.09036591649055481, 0.14330829679965973]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2892625788209952 meters
Mean squared error for test data (degrees):  0.3144660377352203 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.37551463091146586, shape=(), dtype=float64) meters
```

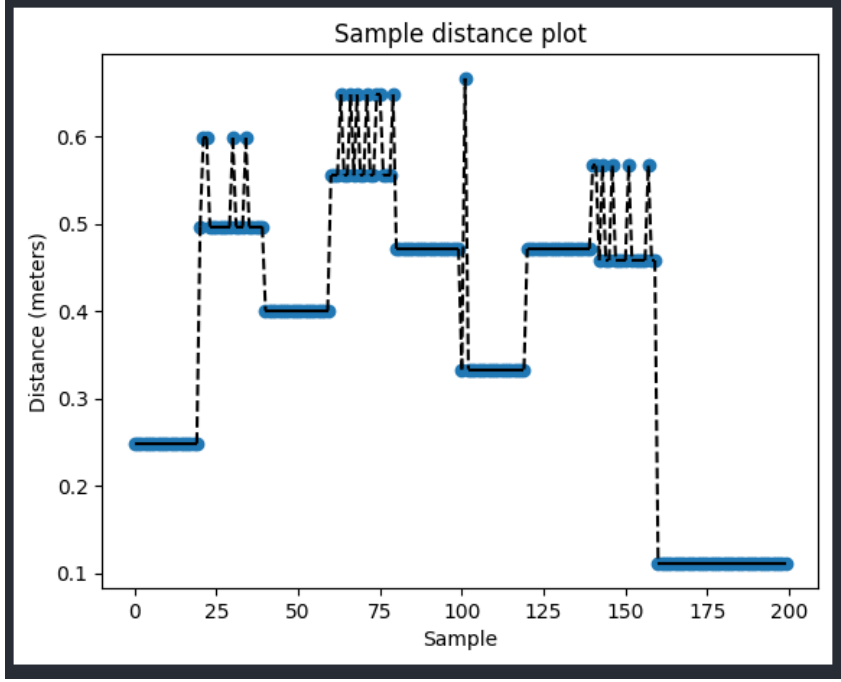


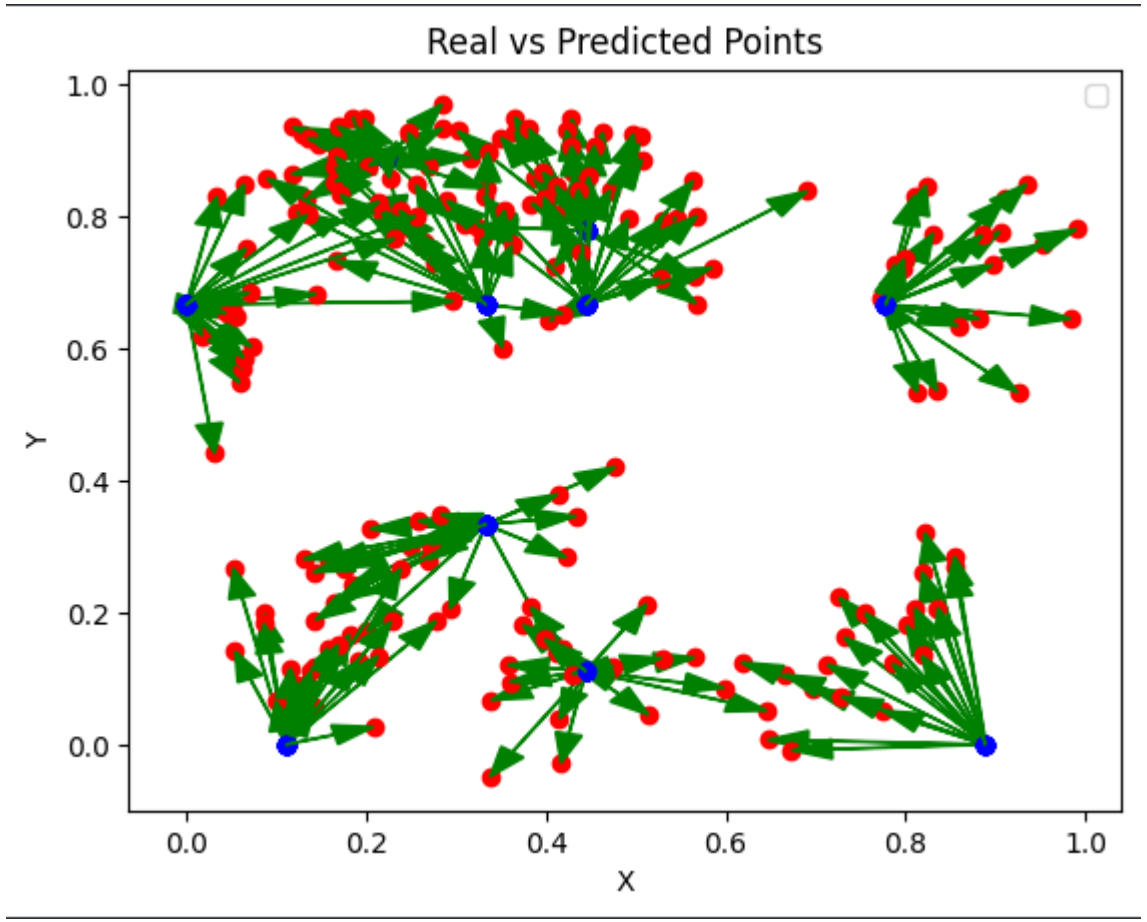


12 Sensors

Model 3

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.28974232912011716 meters
Mean squared error for test data (degrees):  0.28674417556808773 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3759817256426105, shape=(), dtype=float64) meters
```



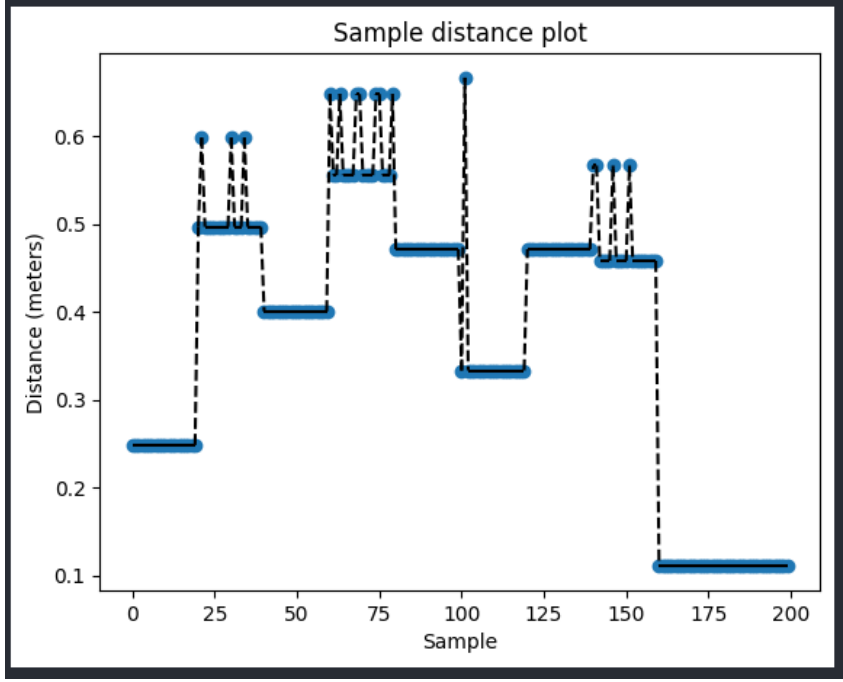


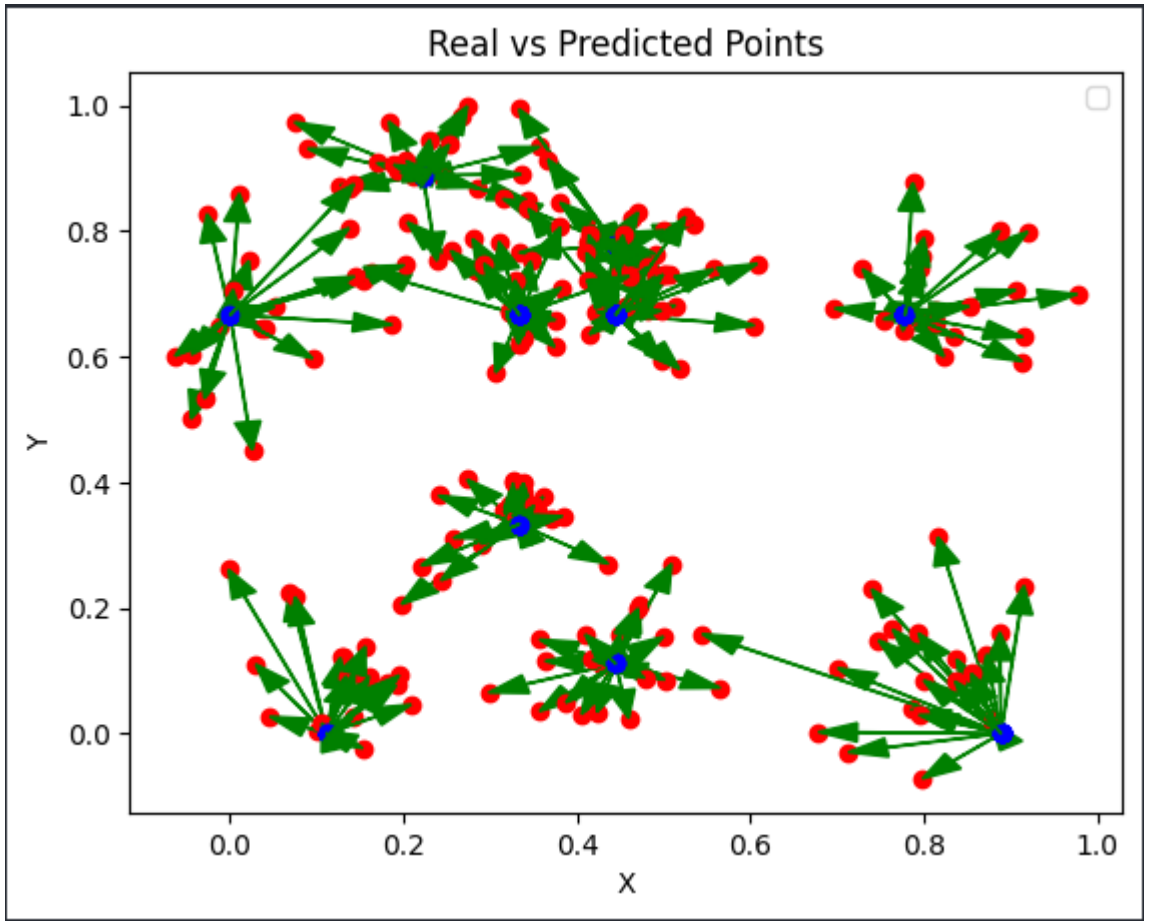
12 Sensors

Model 4

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1132 - xy_loss: 0.1039 - theta_loss: 0.1226 - xy_xy_metric: 0.1029 - theta_theta_metric: 0.1253
Mean Squared Error:  [0.11321137100458145, 0.10386615991592407, 0.12255658209323883, 0.10293643176555634, 0.12527289986610413]
13/13 [==============================] - 0s 2ms/step - loss: 0.1056 - xy_loss: 0.1010 - theta_loss: 0.1103 - xy_xy_metric: 0.1036 - theta_theta_metric: 0.1135
Mean Squared Error:  [0.10562513023614883, 0.10095904022455215, 0.1102912500500679, 0.10362542420625687, 0.11349505931138992]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.28830068322953545 meters
Mean squared error for test data (degrees):  0.28382310609877365 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3743901386270077, shape=(), dtype=float64) meters
```

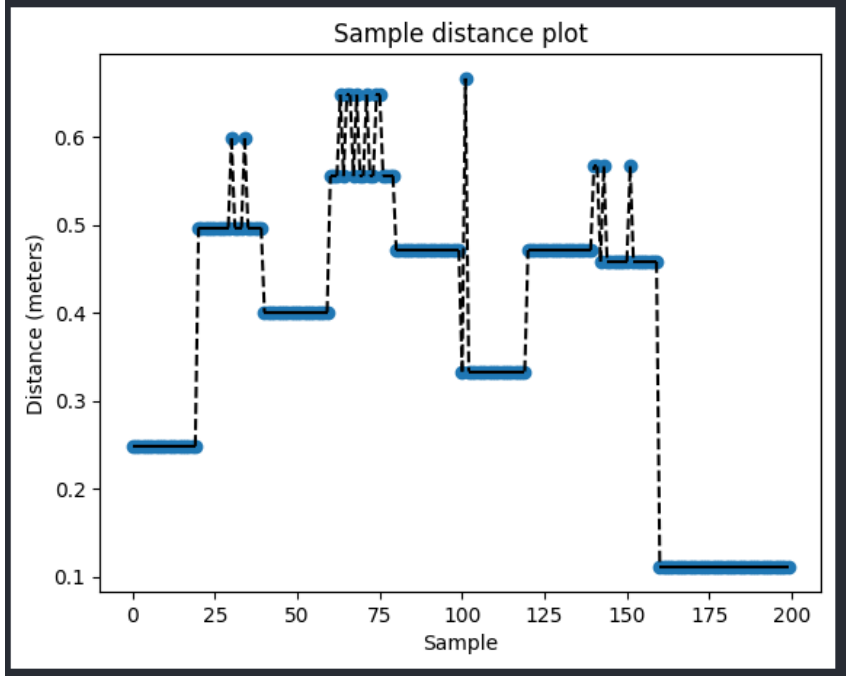


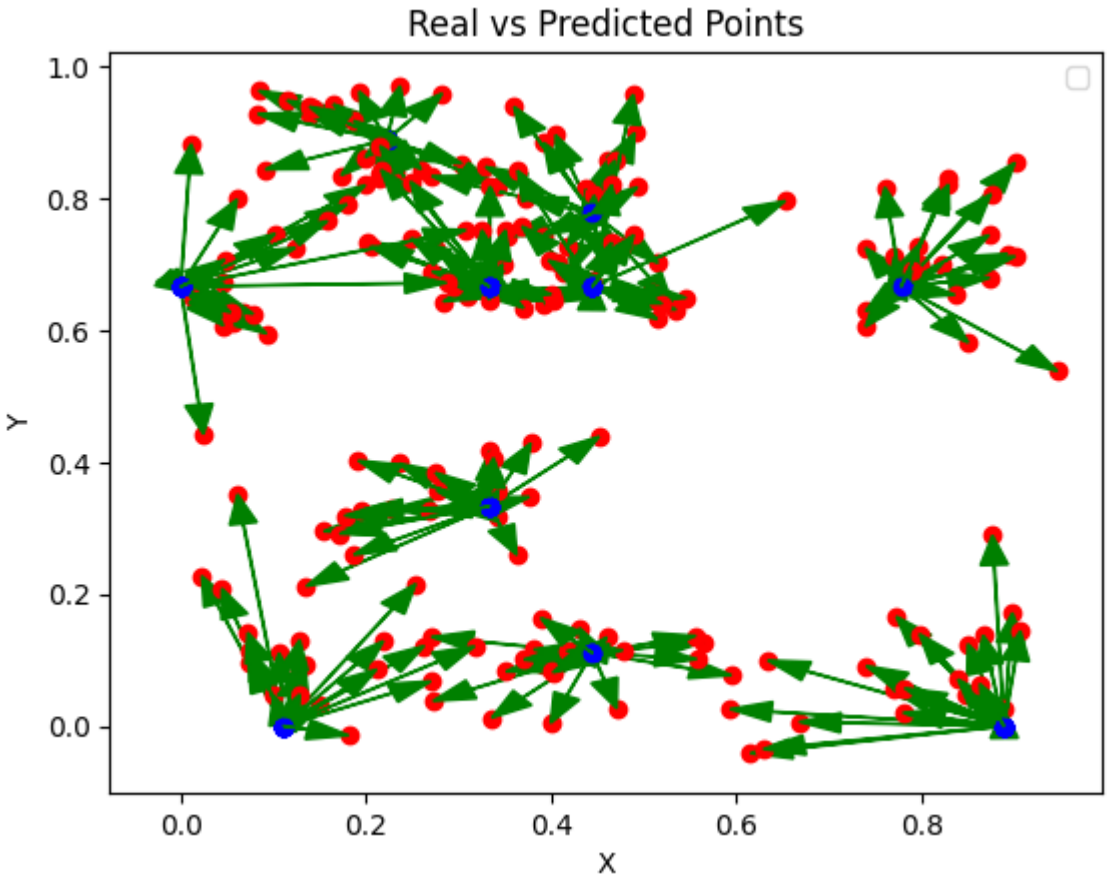


12 Sensors

Model 5

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.28781852993307977 meters
Mean squared error for test data (degrees):  0.27487370837451097 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3738829003758216, shape=(), dtype=float64) meters
```



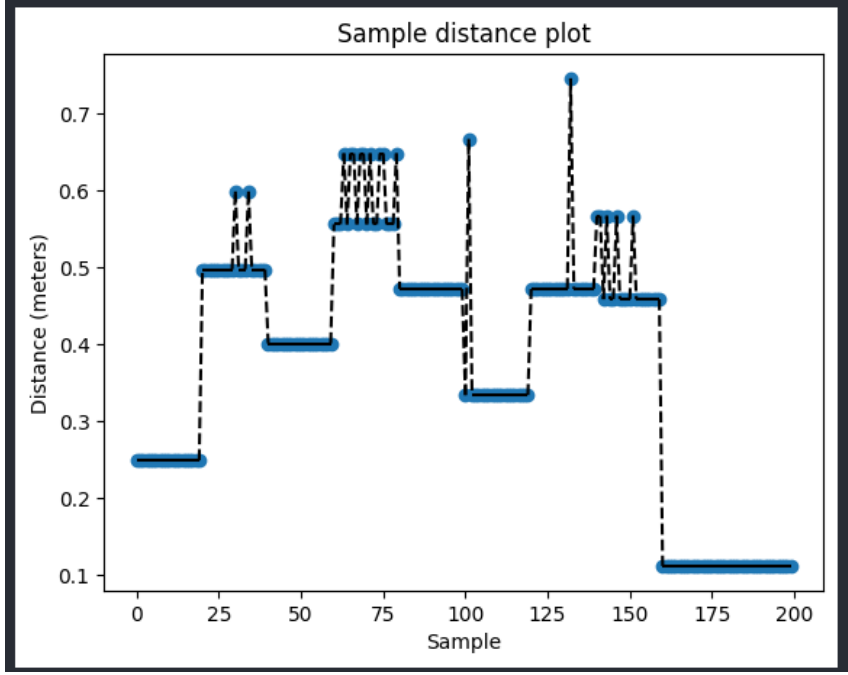


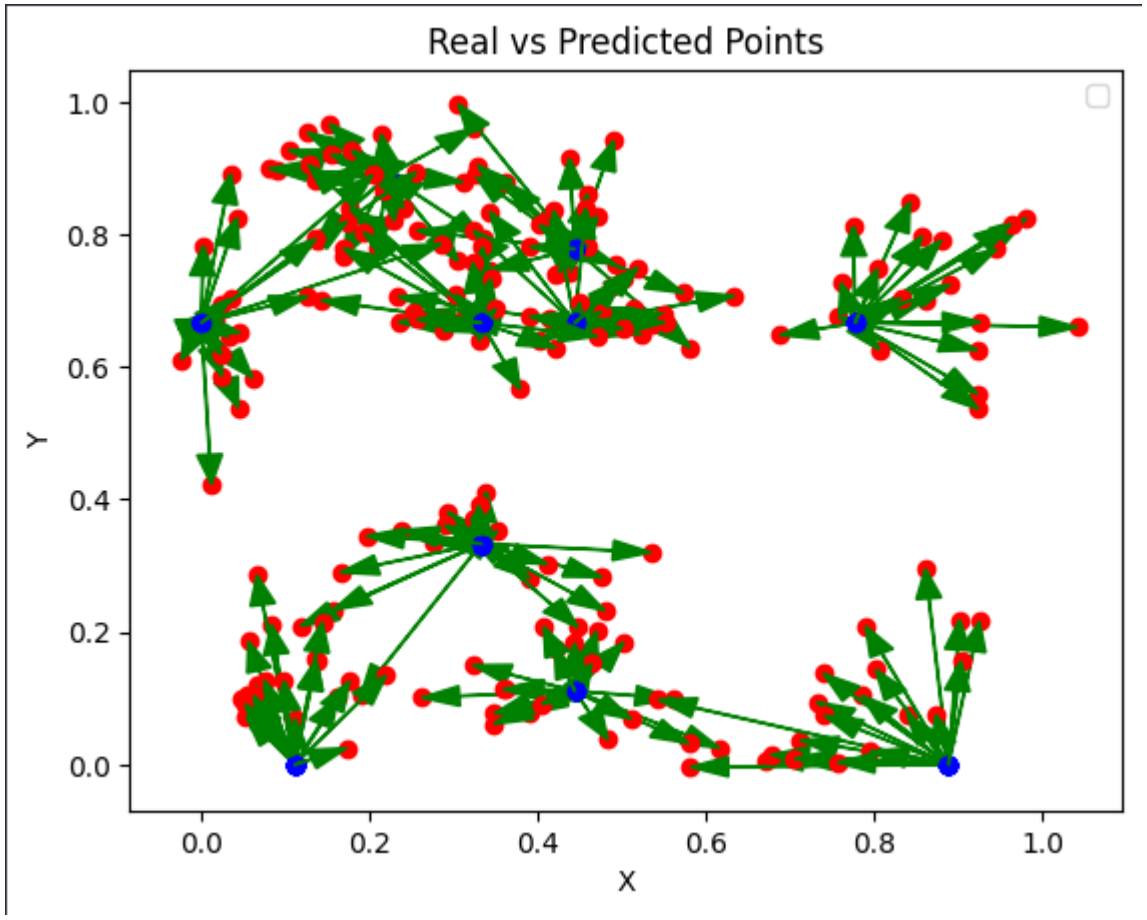
12 Sensors

Model 6

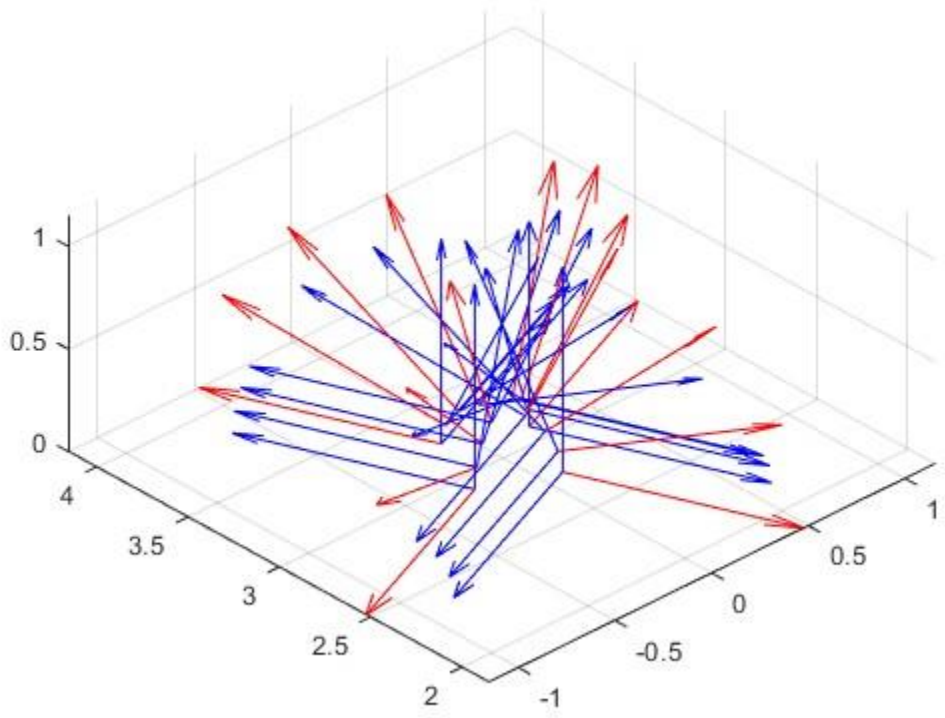
```
7/7 [==============================] - 0s 2ms/step - loss: 0.1151 - xy_loss: 0.1263 - theta_loss: 0.1039 - xy_xy_metric: 0.1280 - theta_theta_metric: 0.1007
Mean Squared Error:  [0.11512775719165802, 0.1263360232114792, 0.10391950607299805, 0.12797629833221436, 0.10069016367197037]
13/13 [==============================] - 0s 2ms/step - loss: 0.1165 - xy_loss: 0.1187 - theta_loss: 0.1143 - xy_xy_metric: 0.1210 - theta_theta_metric: 0.1181
Mean Squared Error:  [0.11651046574115753, 0.11870943009853363, 0.11431151628494263, 0.12101899832487106, 0.11809445917606354]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.29069945448780227 meters
Mean squared error for test data (degrees):  0.28382310609877354 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.37671811199973587, shape=(), dtype=float64) meters
```





16 Sensors

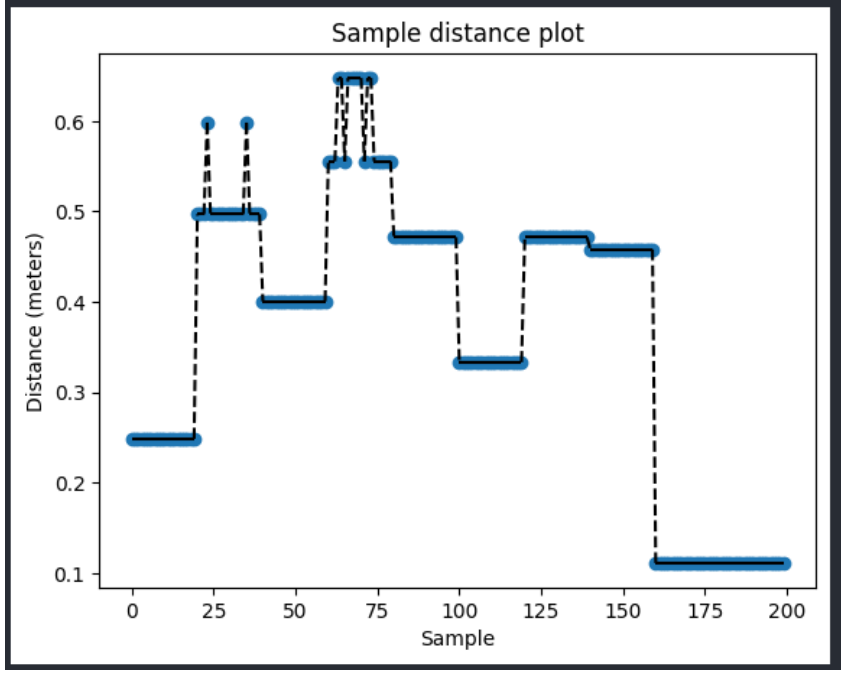


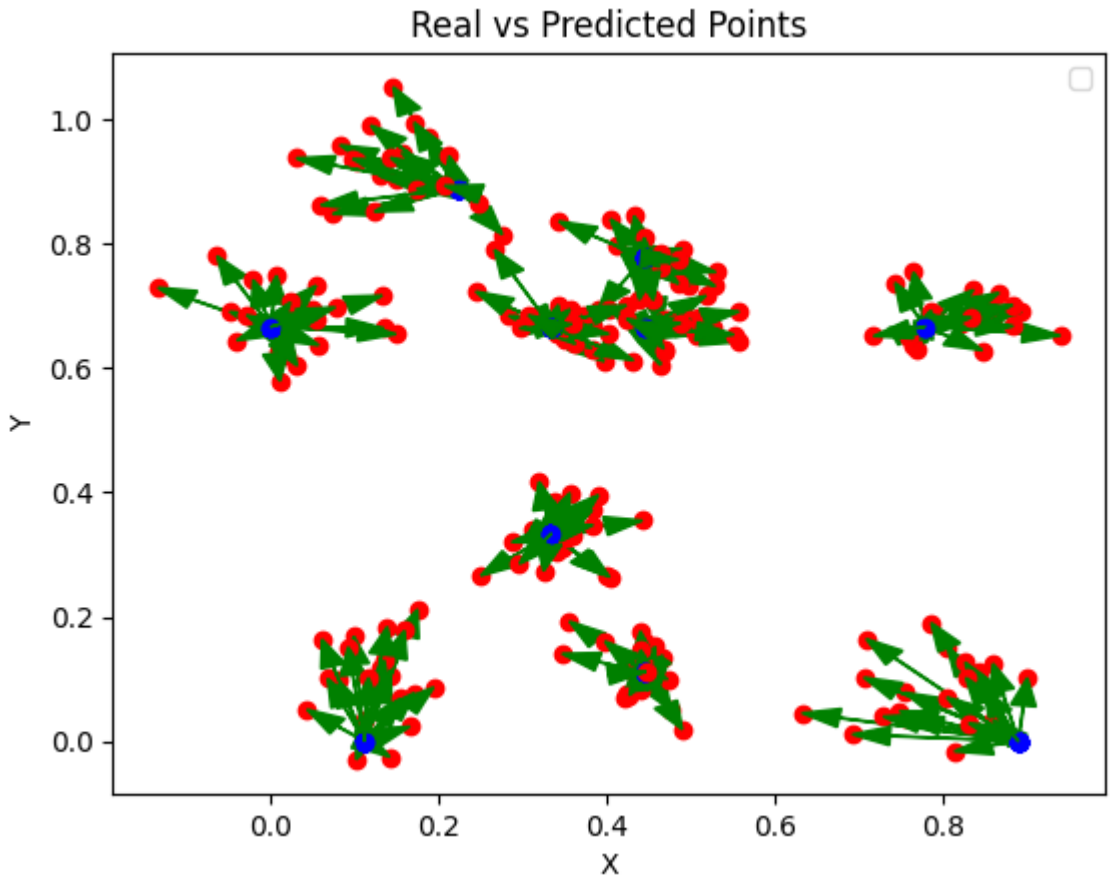
16 Sensors

Model 1

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0911 - xy_loss: 0.0806 - theta_loss: 0.1016 - xy_xy_metric: 0.0850 - theta_theta_metric: 0.1114
Mean Squared Error:  [0.09108849614858627, 0.0806201845407486, 0.10155681520700455, 0.0850406363606453, 0.11136394739151001]
13/13 [==============================] - 0s 2ms/step - loss: 0.0926 - xy_loss: 0.0794 - theta_loss: 0.1059 - xy_xy_metric: 0.0823 - theta_theta_metric: 0.1092
Mean Squared Error:  [0.09264740347862244, 0.07935579121112823, 0.10593900084495544, 0.08227501809597015, 0.10923461616039276]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2853955453120287 meters
Mean squared error for test data (degrees):  0.2527625148017188 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3709708160634827, shape=(), dtype=float64) meters
```



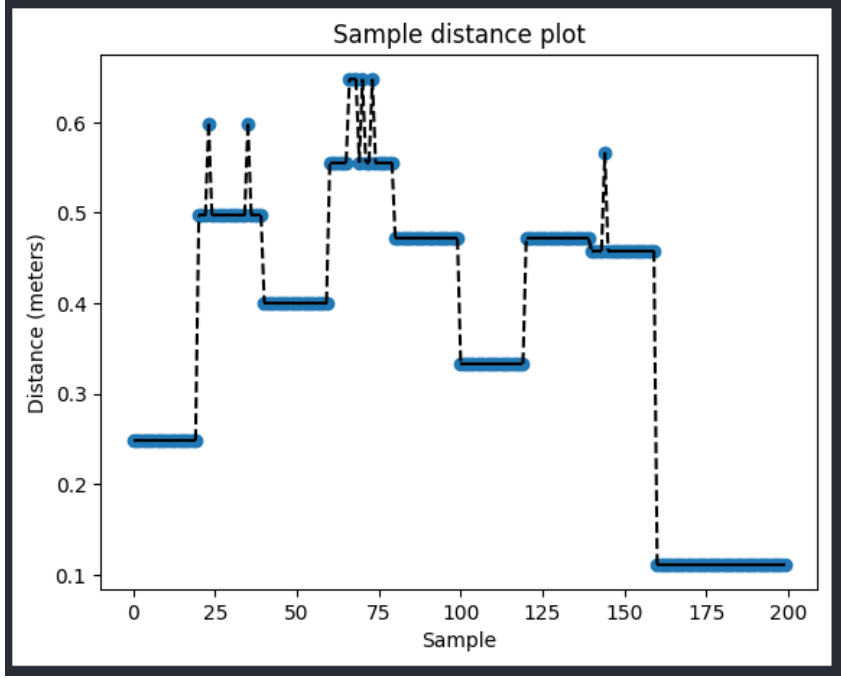


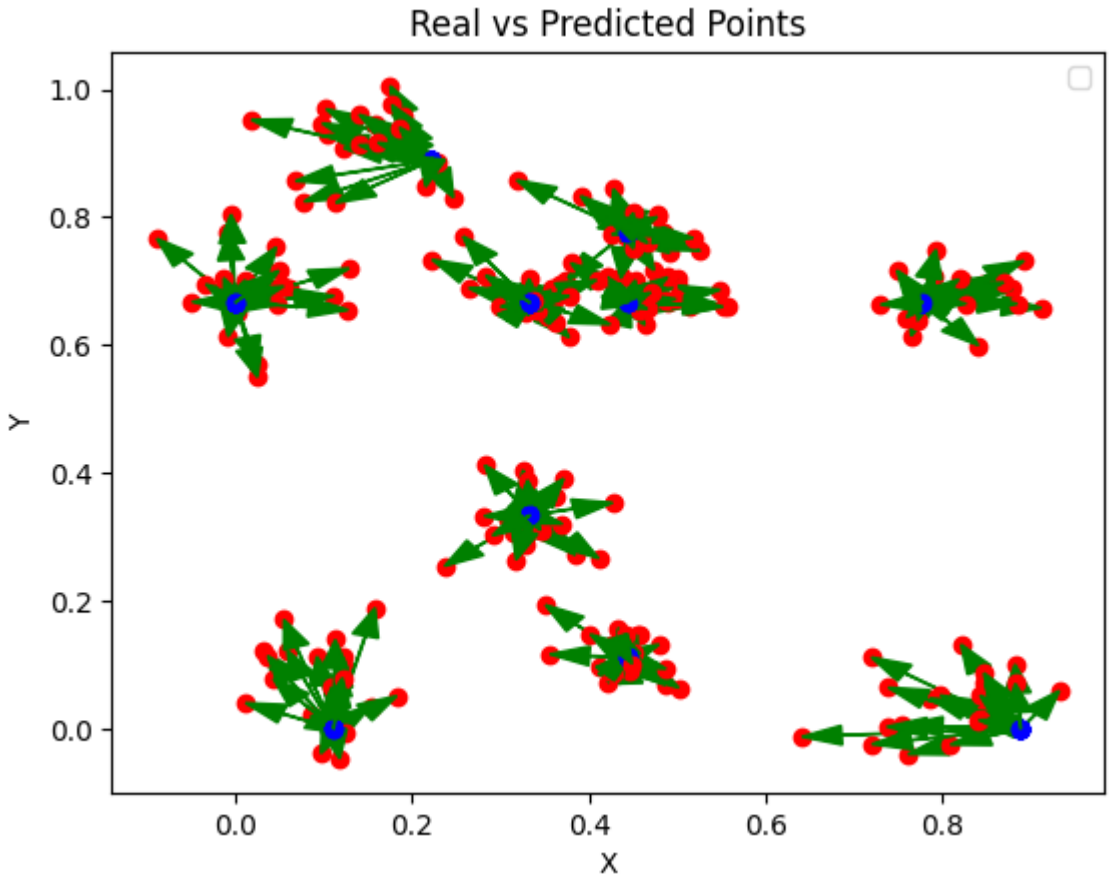
16 Sensors

Model 2

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0848 - xy_loss: 0.0728 - theta_loss: 0.0968 - xy_xy_metric: 0.0742 - theta_theta_metric: 0.1068
Mean Squared Error:  [0.08483617752790451, 0.07284138351678848, 0.09683094918727875, 0.07418085634708405, 0.10679890960454941]
13/13 [==============================] - 0s 2ms/step - loss: 0.0891 - xy_loss: 0.0742 - theta_loss: 0.1041 - xy_xy_metric: 0.0764 - theta_theta_metric: 0.1064
Mean Squared Error:  [0.08912966400384903, 0.07419876754283905, 0.10406056046485901, 0.07644979655742645, 0.10639713704586029]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.28393182975956904 meters
Mean squared error for test data (degrees):  0.24944382578492988 radians
############################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3696664306793682, shape=(), dtype=float64) meters
```



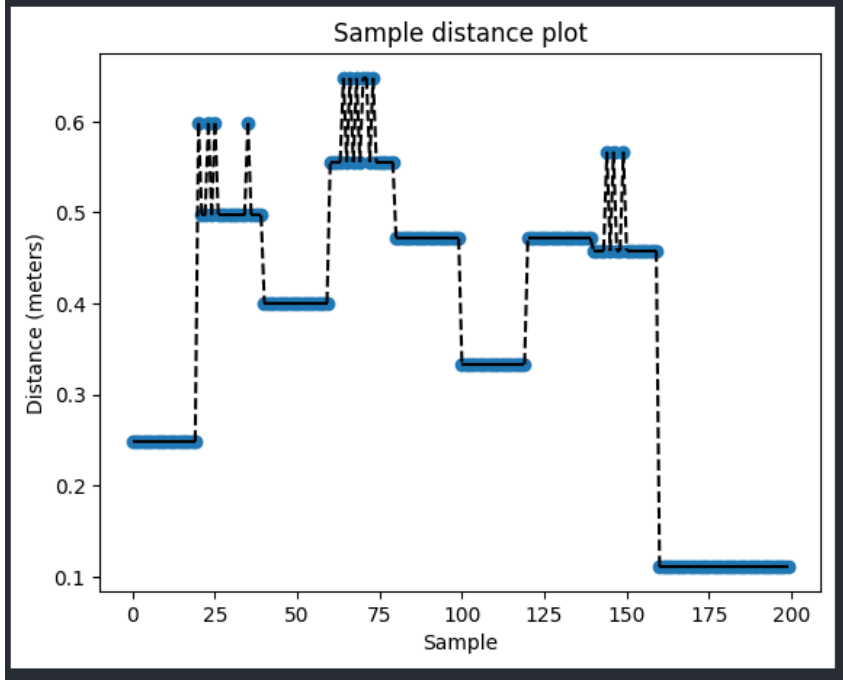


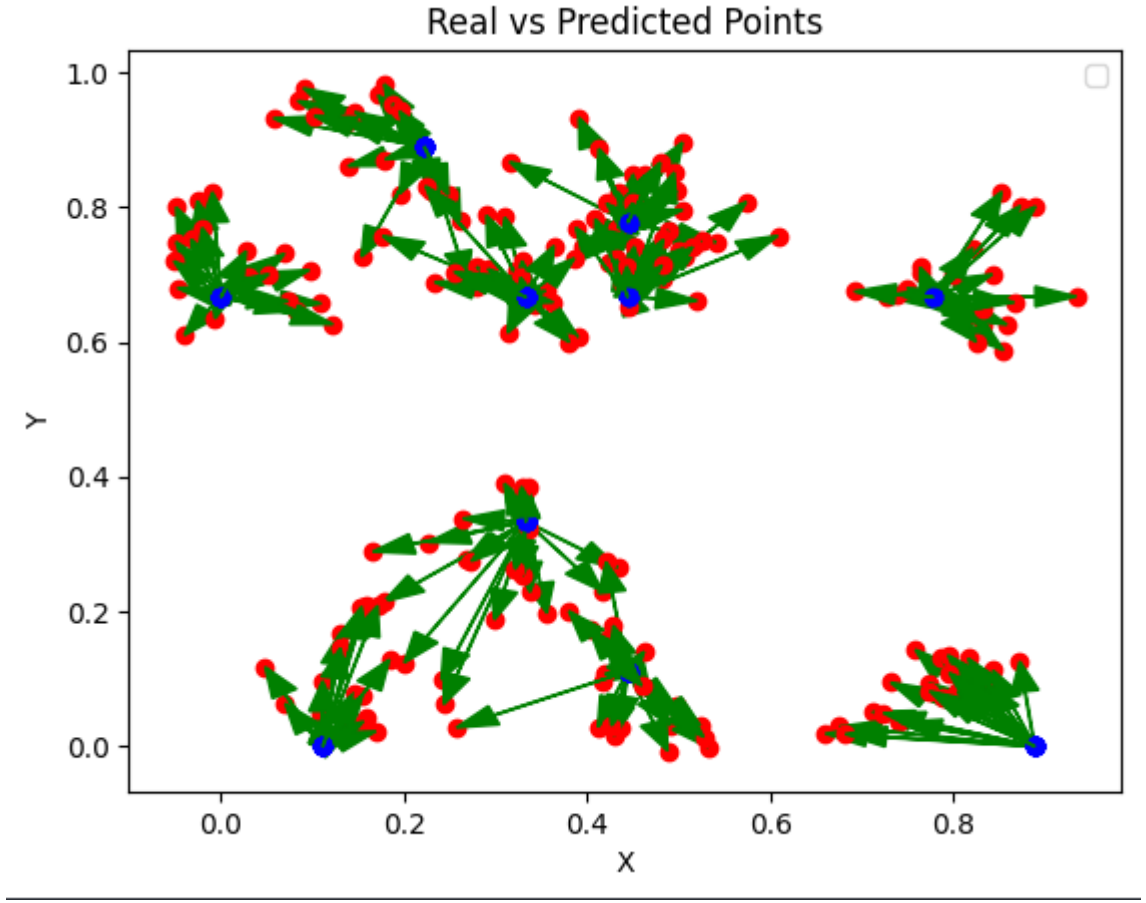
16 Sensors

Model 3

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1326 - xy_loss: 0.1015 - theta_loss: 0.1636 - xy_xy_metric: 0.1065 - theta_theta_metric: 0.1604
Mean Squared Error:  [0.13258077204227448, 0.10152226686477661, 0.16363927721977234, 0.10654859244823456, 0.16043739020824432]
13/13 [==============================] - 0s 2ms/step - loss: 0.1302 - xy_loss: 0.1015 - theta_loss: 0.1590 - xy_xy_metric: 0.1054 - theta_theta_metric: 0.1592
Mean Squared Error:  [0.13022854924201965, 0.10149593651294708, 0.15896113216876984, 0.10537994652986526, 0.1592307984828949]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.28636719930799653 meters
Mean squared error for test data (degrees):  0.33499585403736326 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3722268958877379, shape=(), dtype=float64) meters
```



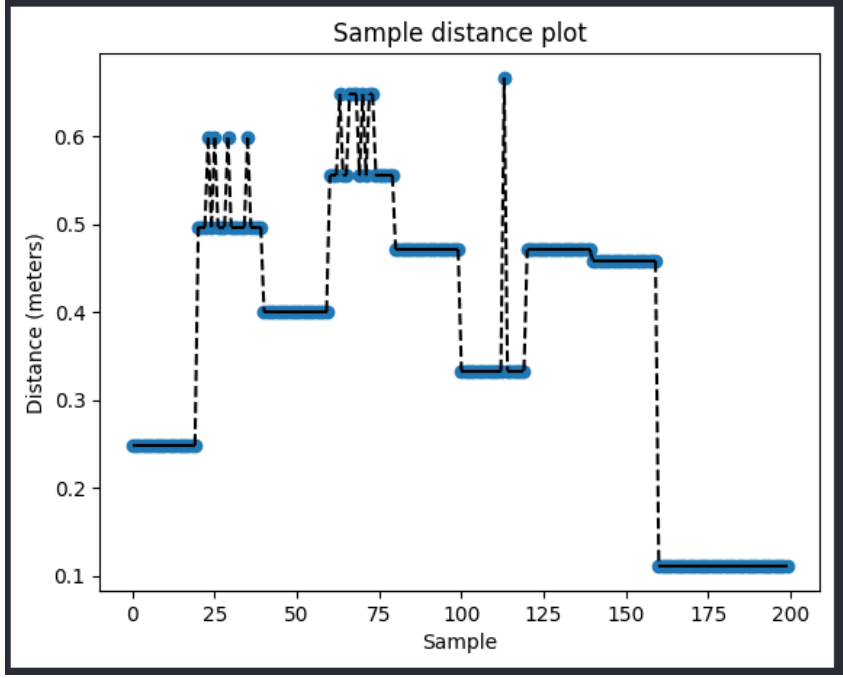


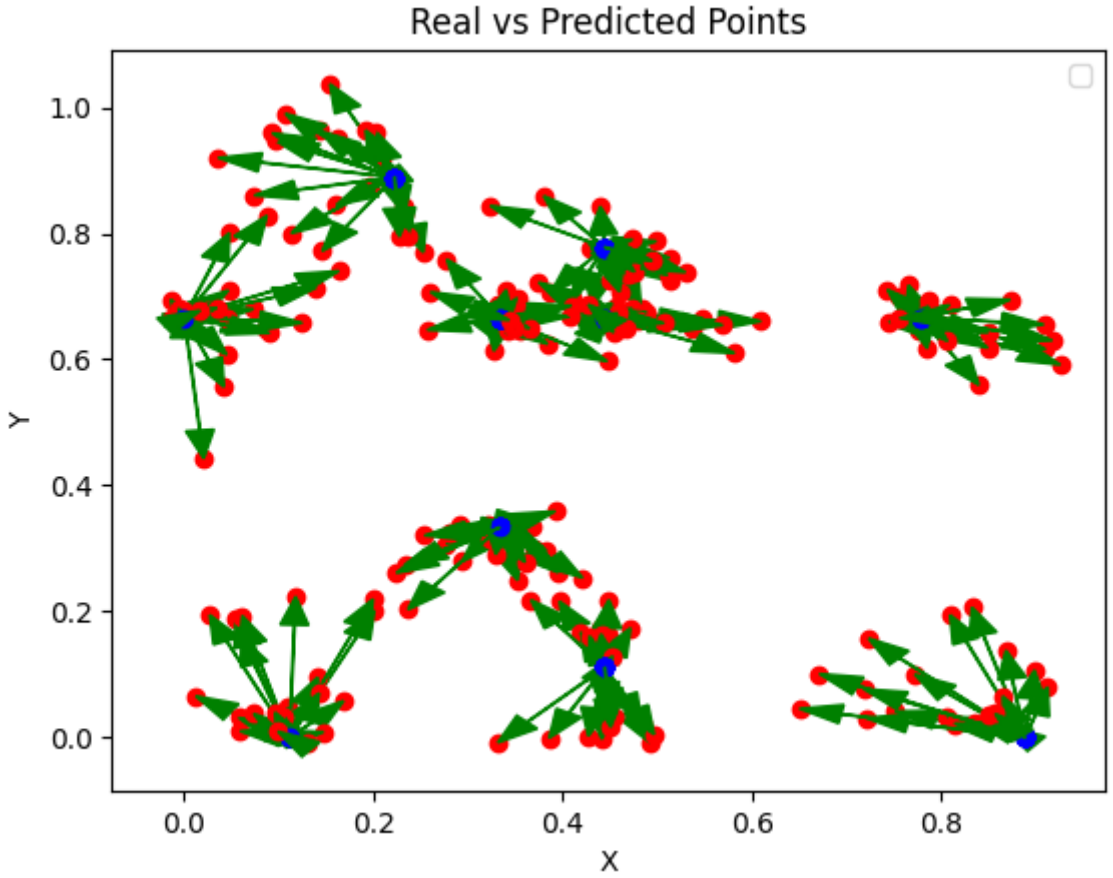
16 Sensors

Model 4

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1415 - xy_loss: 0.0844 - theta_loss: 0.1987 - xy_xy_metric: 0.0824 - theta_theta_metric: 0.2173
Mean Squared Error:  [0.14152897894382477, 0.08440115302801132, 0.1986568123102188, 0.08238975703716278, 0.21731169521808624]
13/13 [==============================] - 0s 2ms/step - loss: 0.1597 - xy_loss: 0.0860 - theta_loss: 0.2334 - xy_xy_metric: 0.0882 - theta_theta_metric: 0.2380
Mean Squared Error:  [0.1596997231245041, 0.08599870651960373, 0.2334007322788238, 0.08819428831338882, 0.2380015105009079]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2868517920761235 meters
Mean squared error for test data (degrees):  0.3815174380753201 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.37272867934936005, shape=(), dtype=float64) meters
```





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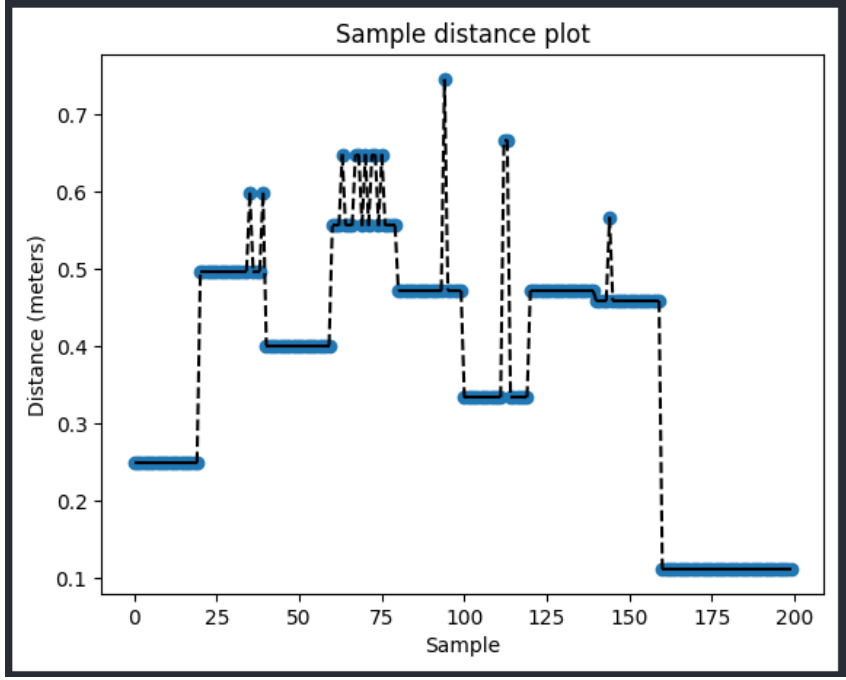
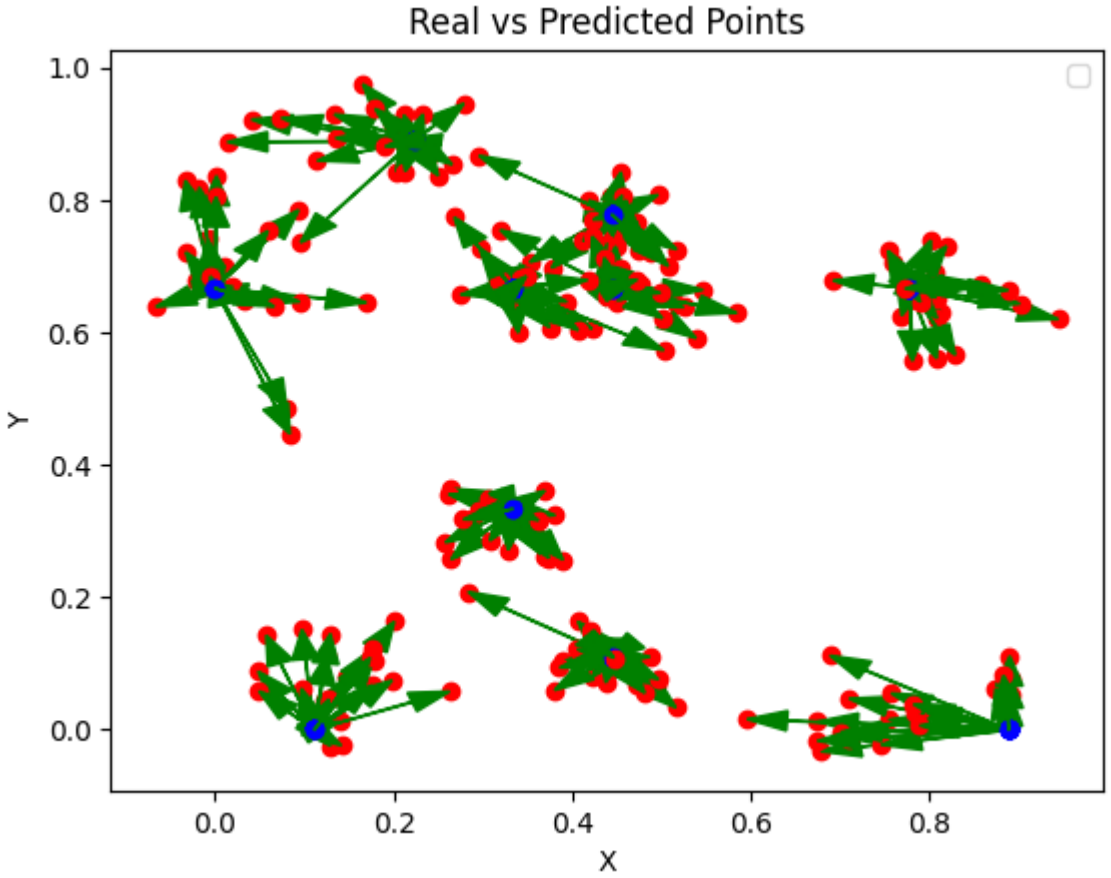
Model 5

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0947 - xy_loss: 0.0803 - theta_loss: 0.1092 - xy_xy_metric: 0.0844 - theta_theta_metric: 0.1052
Mean Squared Error:  [0.09474553912878036, 0.08029710501432419, 0.10919399559497833, 0.08442353457212448, 0.10524018108844757]
13/13 [==============================] - 0s 2ms/step - loss: 0.0925 - xy_loss: 0.0863 - theta_loss: 0.0986 - xy_xy_metric: 0.0886 - theta_theta_metric: 0.1011
Mean Squared Error:  [0.09246216714382172, 0.08631964772939682, 0.09860467910766602, 0.08856641501188278, 0.10105839371681213]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.2892625788209952 meters
Mean squared error for test data (degrees):  0.31972210155418157 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.37529280125440745, shape=(), dtype=float64) meters
```





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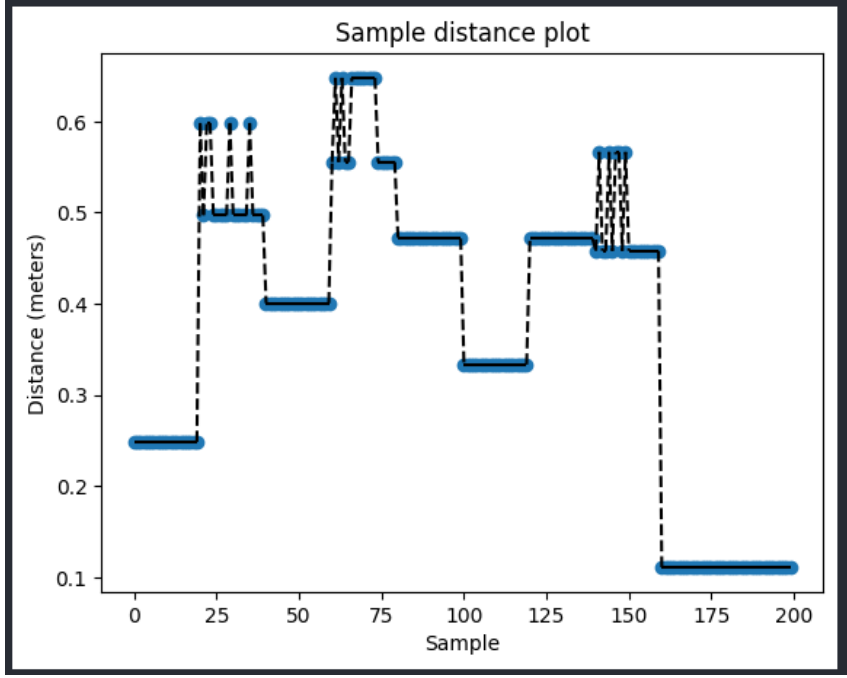
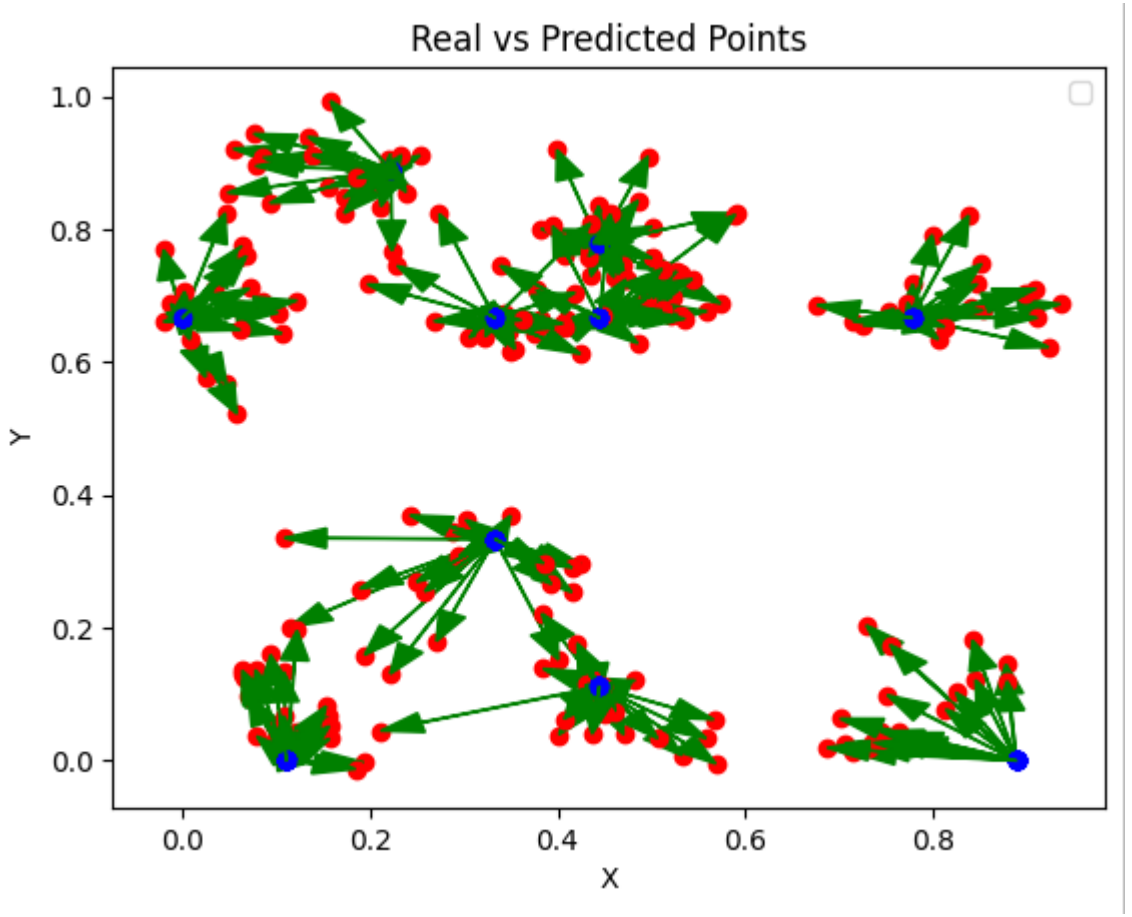
Model 6

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1011 - xy_loss: 0.0966 - theta_loss: 0.1055 - xy_xy_metric: 0.0987 - theta_theta_metric: 0.1080
Mean Squared Error:  [0.1010642796754837, 0.09660927951335907, 0.10551926493644714, 0.09873895347118378, 0.10799069702625275]
13/13 [==============================] - 0s 2ms/step - loss: 0.1030 - xy_loss: 0.1005 - theta_loss: 0.1055 - xy_xy_metric: 0.1049 - theta_theta_metric: 0.1070
Mean Squared Error:  [0.10297216475009918, 0.10045655071735382, 0.10548776388168335, 0.10485957562923431, 0.10701186209917068]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.28974232912011716 meters
Mean squared error for test data (degrees):  0.3197221015541815 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3756650426696637, shape=(), dtype=float64) meters
```





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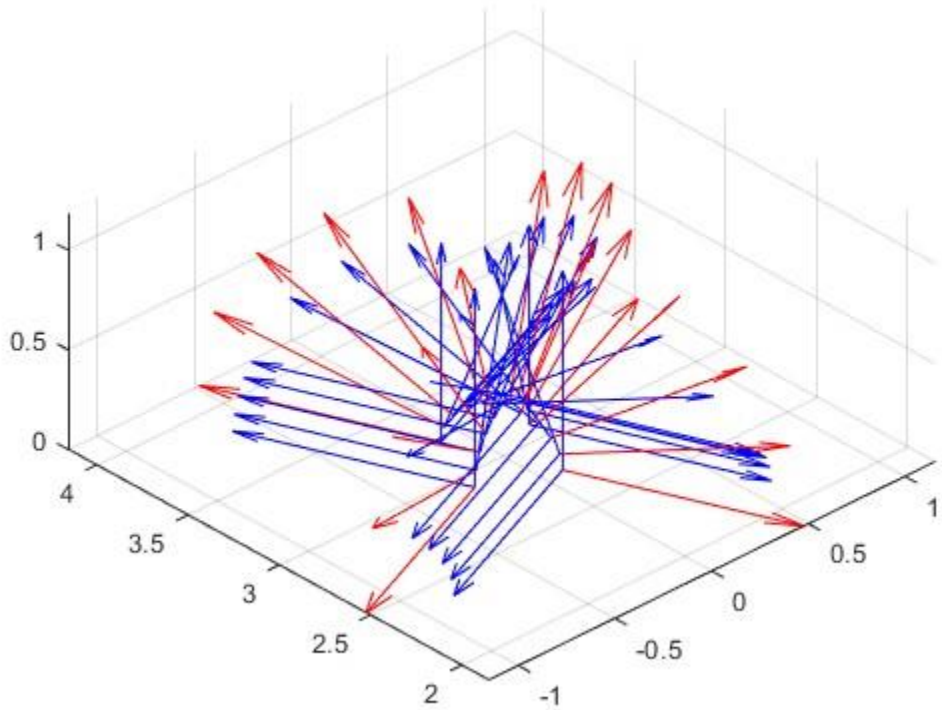

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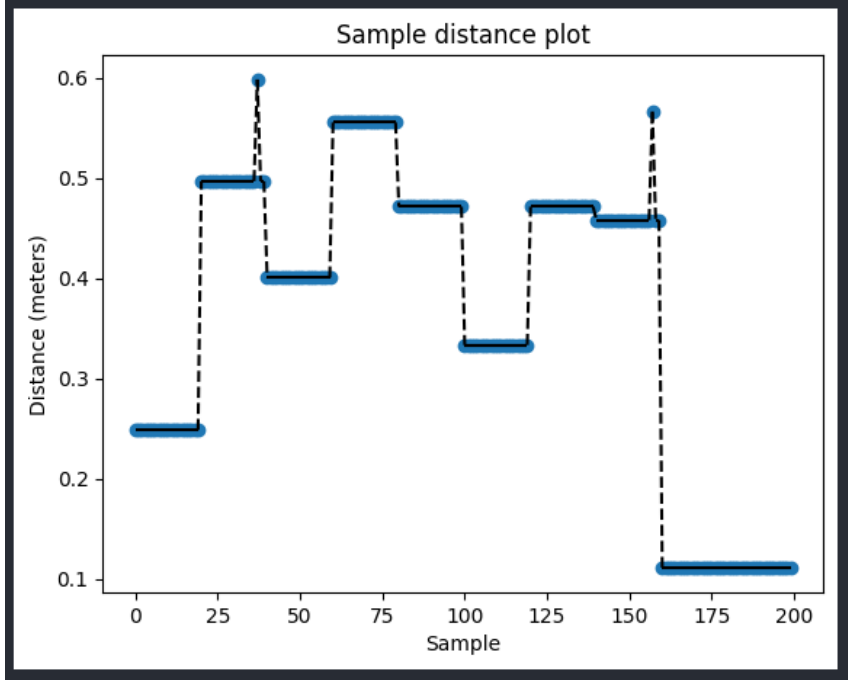
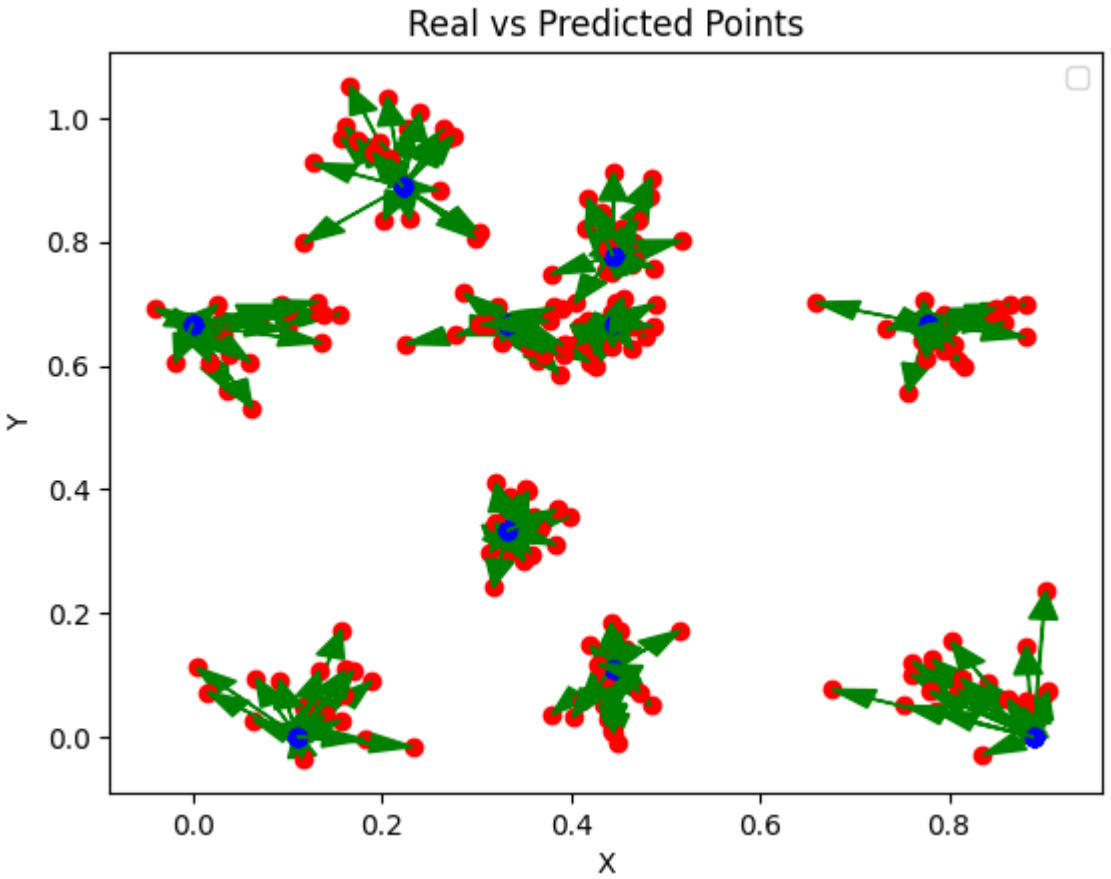
Model 1

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0795 - xy_loss: 0.0720 - theta_loss: 0.0870 - xy_xy_metric: 0.0737 - theta_theta_metric: 0.0919
Mean Squared Error:  [0.07947032153606415, 0.07197098433971405, 0.08669964383125305, 0.07365621626377106, 0.09193044155836105]
13/13 [==============================] - 0s 2ms/step - loss: 0.0823 - xy_loss: 0.0694 - theta_loss: 0.0952 - xy_xy_metric: 0.0723 - theta_theta_metric: 0.0989
Mean Squared Error:  [0.08229514956474304, 0.06943933665752411, 0.09515095502138138, 0.07231950759887695, 0.09894867986440659]

7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.280981524808928 meters
Mean squared error for test data (degrees):  0.23921166824012258 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.36685099272027843, shape=(), dtype=float64) meters
```





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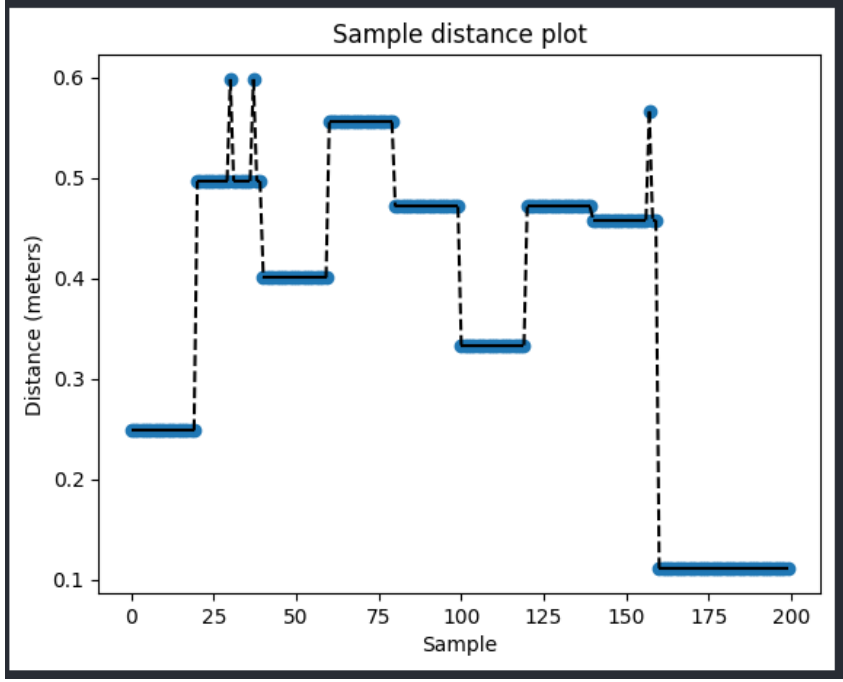
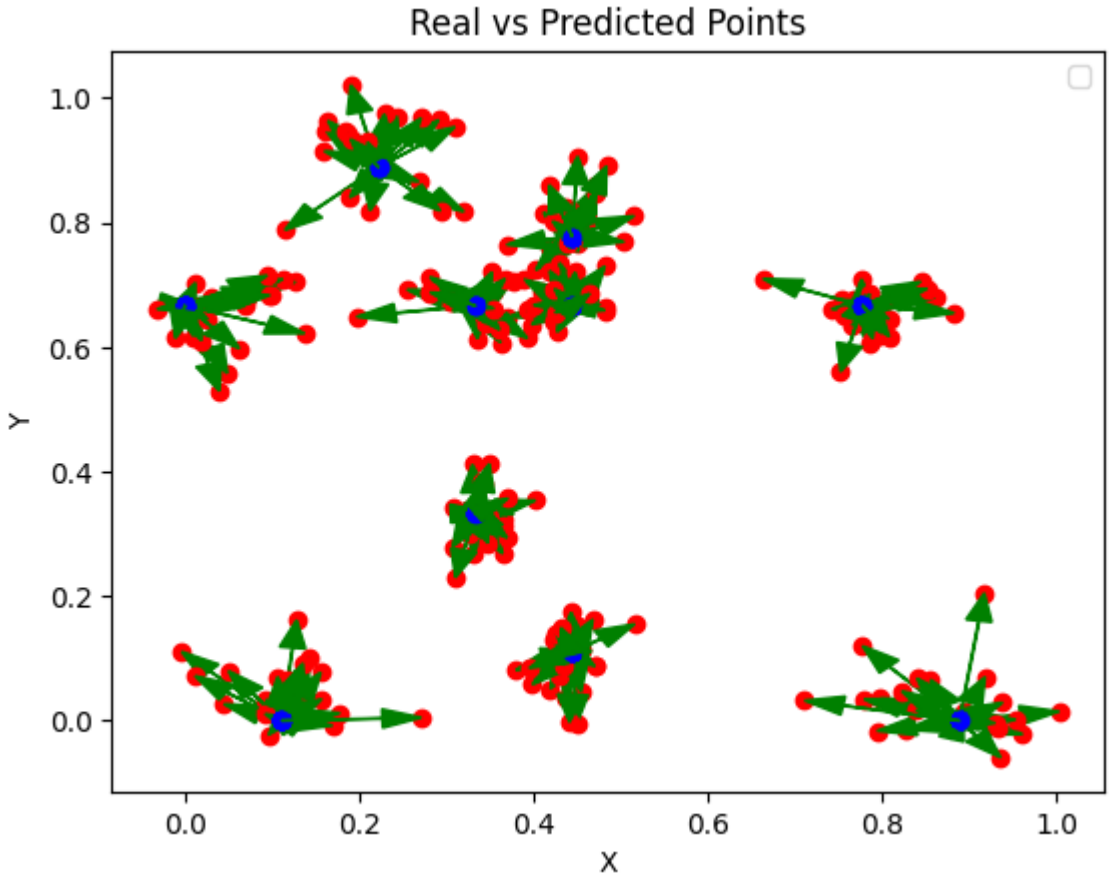
Model 2

```
7/7 [==============================] - 0s 3ms/step - loss: 0.0823 - xy_loss: 0.0649 - theta_loss: 0.0997 - xy_xy_metric: 0.0671 - theta_theta_metric: 0.1004
Mean Squared Error:  [0.08228428661823273, 0.06490547955036163, 0.09966309368610382, 0.06711627542972565, 0.10043703019618988]
13/13 [==============================] - 0s 2ms/step - loss: 0.0869 - xy_loss: 0.0654 - theta_loss: 0.1084 - xy_xy_metric: 0.0666 - theta_theta_metric: 0.1126
Mean Squared Error:  [0.08688939362764359, 0.0653599426150322, 0.10841883718967438, 0.06655313074588776, 0.11263100802898407]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.28147538979763 04 meters
Mean squared error for test data (degrees):  0.2592724864350679 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.36735823097146453, shape=(), dtype=float64) meters
```





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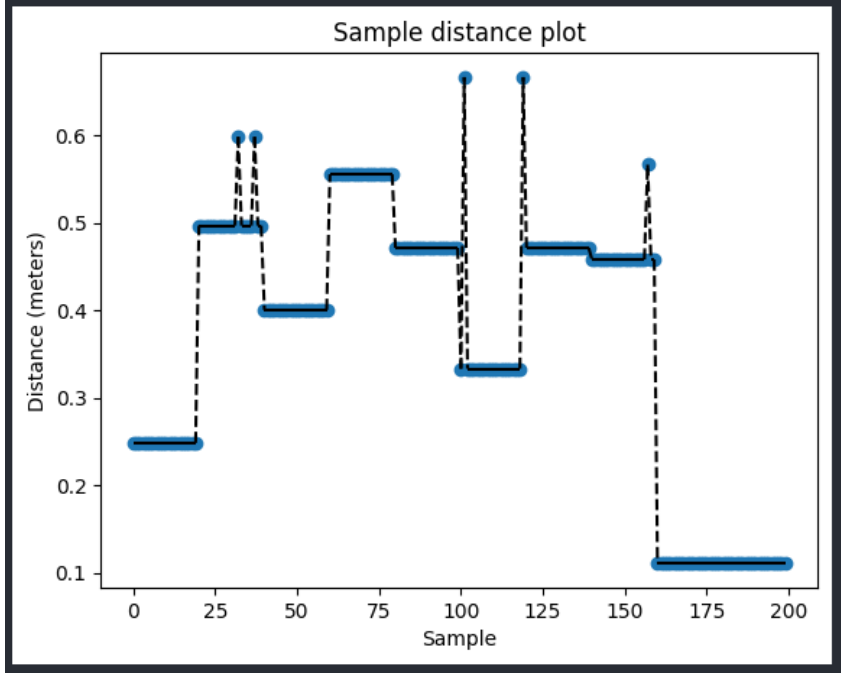
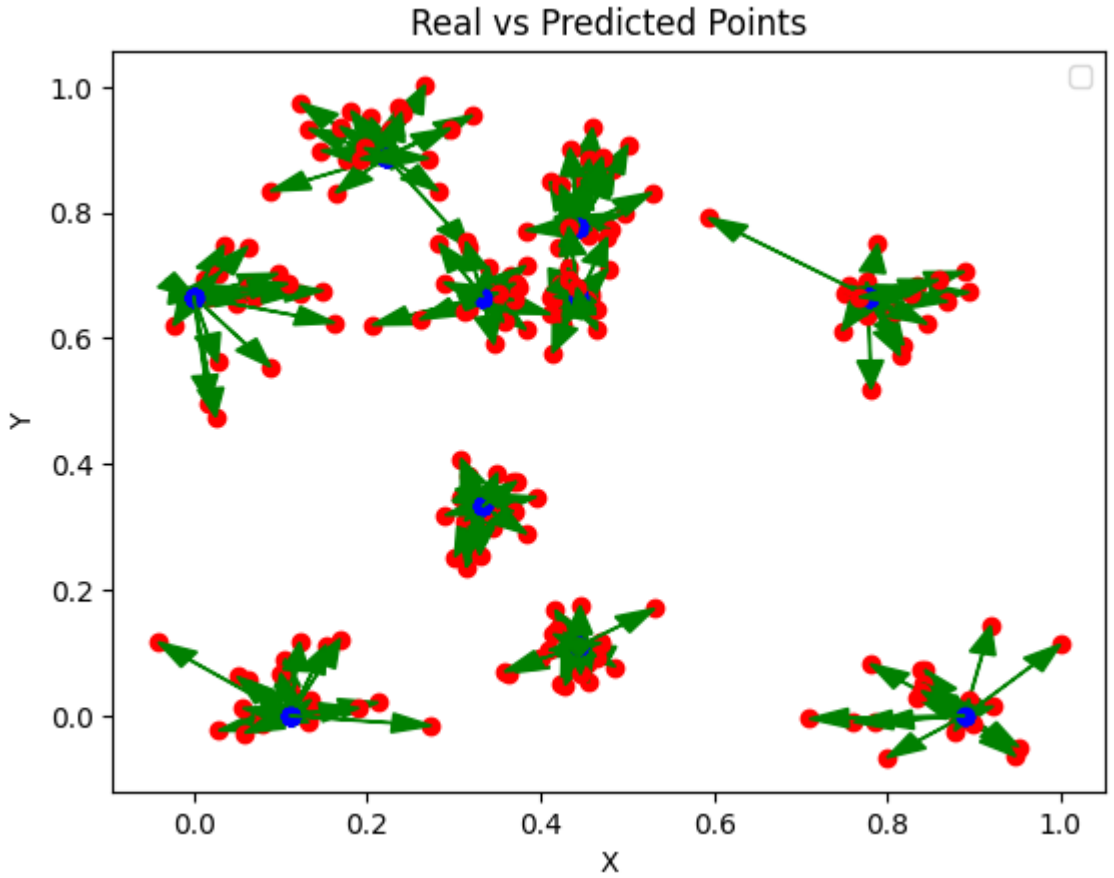
Model 3

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1008 - xy_loss: 0.0707 - theta_loss: 0.1309 - xy_xy_metric: 0.0736 - theta_theta_metric: 0.1222
Mean Squared Error:  [0.10076063871383667, 0.07066548615694046, 0.1308557689189911, 0.07356524467468262, 0.12216413021087646]
13/13 [==============================] - 0s 2ms/step - loss: 0.1038 - xy_loss: 0.0726 - theta_loss: 0.1349 - xy_xy_metric: 0.0741 - theta_theta_metric: 0.1374
Mean Squared Error:  [0.10377726703882217, 0.07263986766338348, 0.13491468131542206, 0.07407940179109573, 0.13735781610012054]
```

```
7/7 [==============================] - 0s 918us/step
Mean Error for test data (distance):  0.28442057191489273 meters
Mean squared error for test data (degrees):  0.28963578661637973 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.37069156430479777, shape=(), dtype=float64) meters
```





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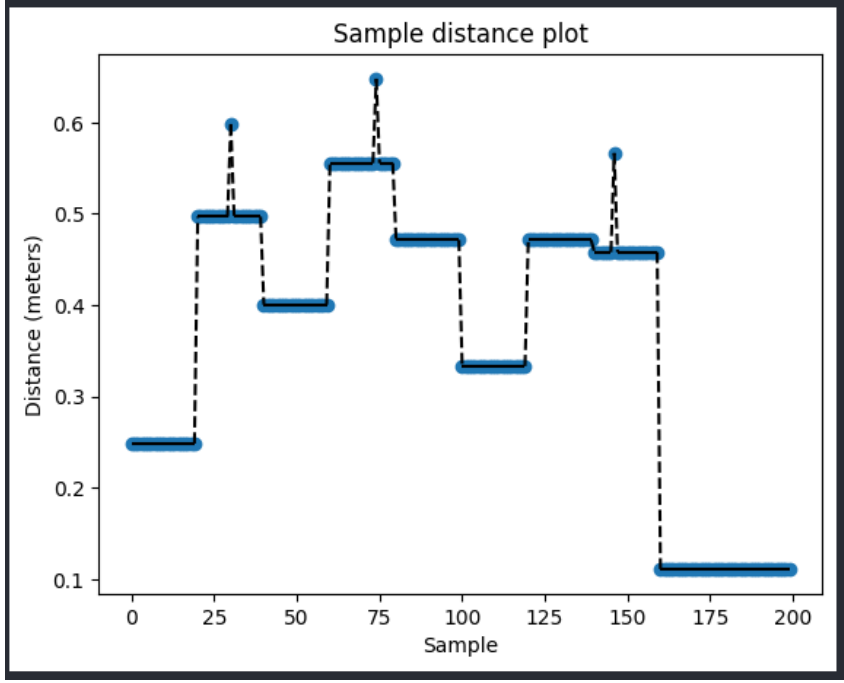
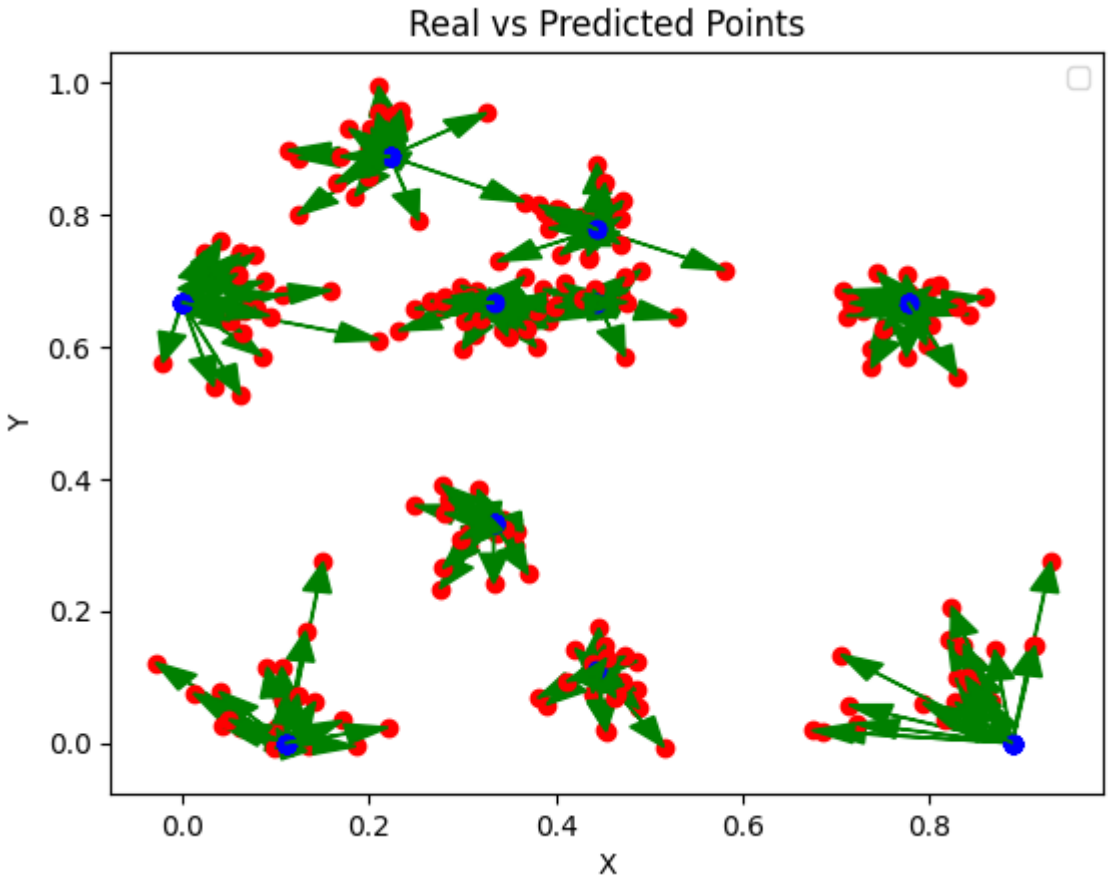
Model 4

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0967 - xy_loss: 0.0765 - theta_loss: 0.1168 - xy_xy_metric: 0.0785 - theta_theta_metric: 0.1185
Mean Squared Error:  [0.09666459262371063, 0.07654187083244324, 0.11678729951381683, 0.0784638524055481, 0.11852794140577316]
13/13 [==============================] - 0s 2ms/step - loss: 0.1013 - xy_loss: 0.0765 - theta_loss: 0.1261 - xy_xy_metric: 0.0799 - theta_theta_metric: 0.1275
Mean Squared Error:  [0.1012883111834526, 0.07652438431978226, 0.12605223059654236, 0.07991795986890793, 0.1275050640106201 2]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2814753897976304 meters
Mean squared error for test data (degrees):  0.26874192494328536 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3673126326618592, shape=(), dtype=float64) meters
```





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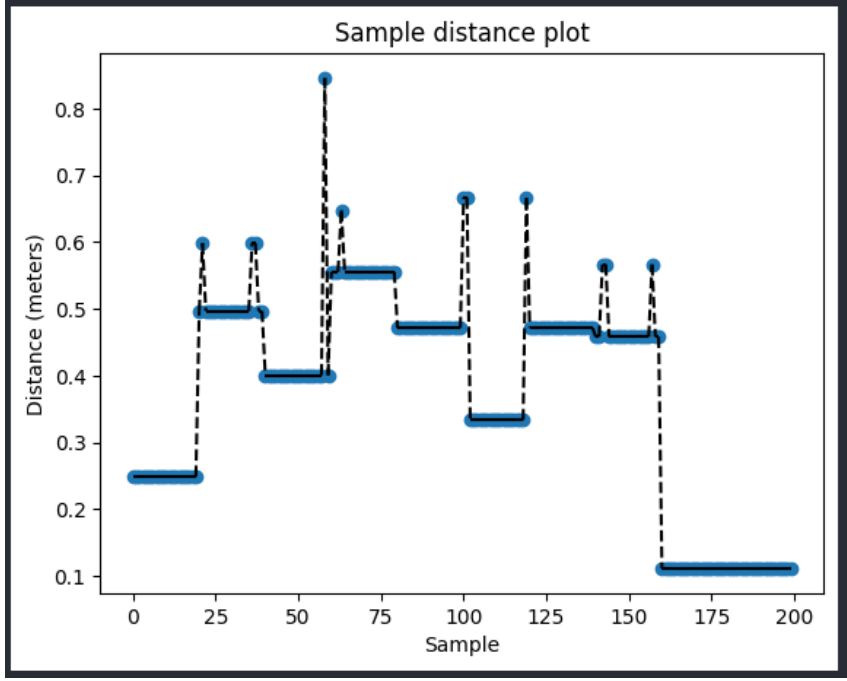
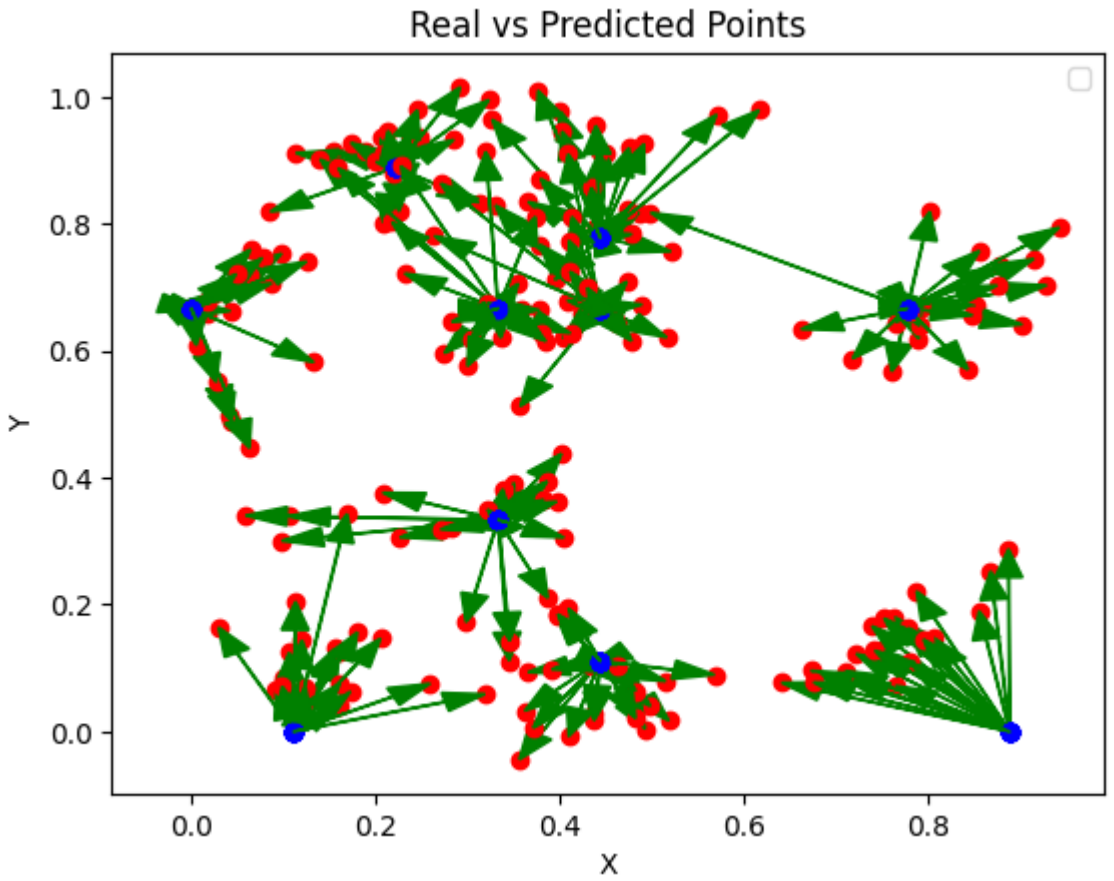
Model 5

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1188 - xy_loss: 0.1183 - theta_loss: 0.1193 - xy_xy_metric: 0.1246 - theta_theta_metric: 0.1134
Mean Squared Error:  [0.11876100301742554, 0.11825238168239594, 0.11926961690187454, 0.12461566925048828, 0.11340753734111786]
13/13 [==============================] - 0s 2ms/step - loss: 0.1124 - xy_loss: 0.1026 - theta_loss: 0.1221 - xy_xy_metric: 0.1073 - theta_theta_metric: 0.1266
Mean Squared Error:  [0.11235376447439194, 0.10255880653858185, 0.12214874476194382, 0.10728056728839874, 0.12660729885101318]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2902212863690877 meters
Mean squared error for test data (degrees):  0.2778888666755514 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.376639358945537, shape=(), dtype=float64) meters
```





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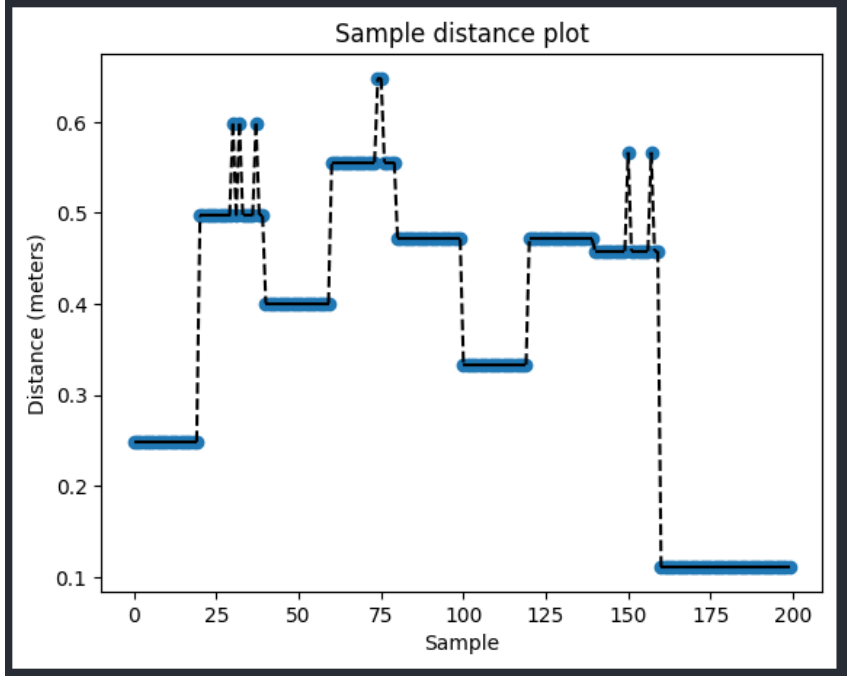
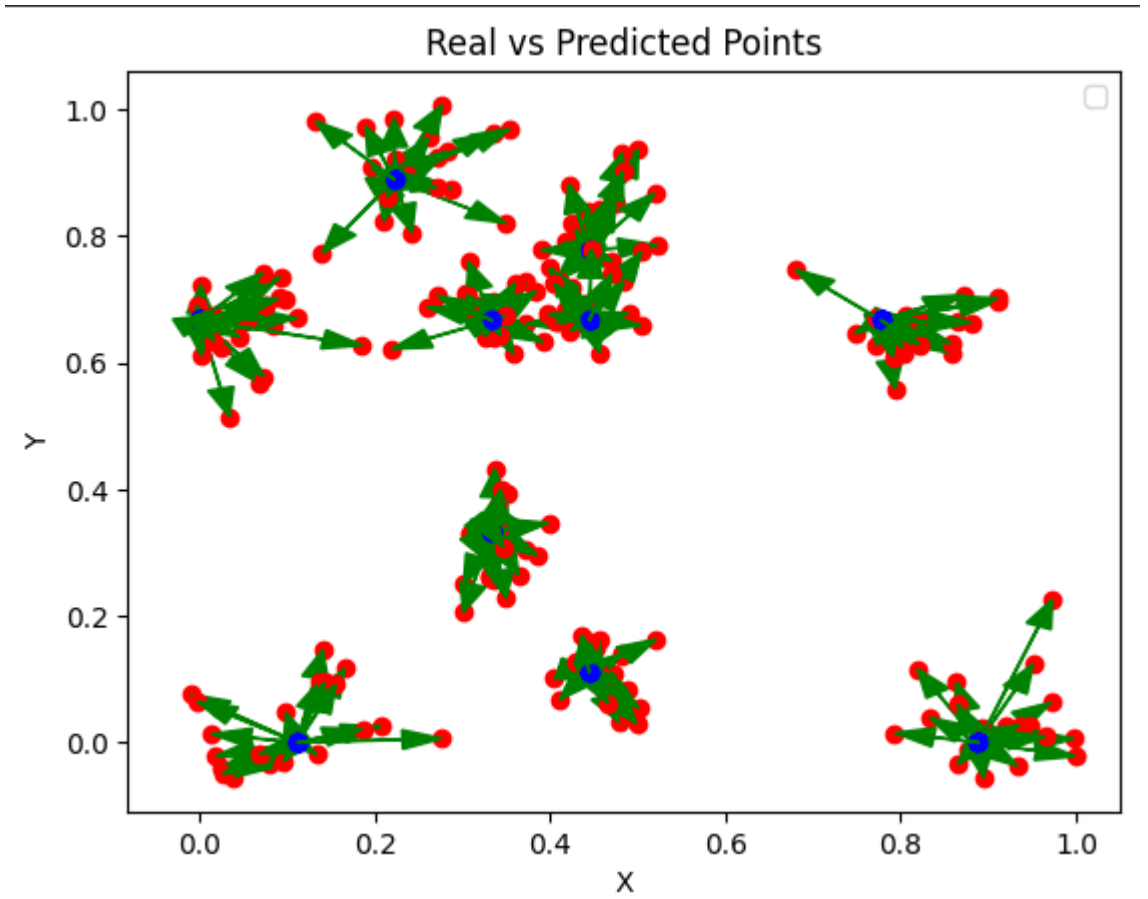
Model 6

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0750 - xy_loss: 0.0705 - theta_loss: 0.0796 - xy_xy_metric: 0.0732 - theta_theta_metric: 0.0758
Mean Squared Error:  [0.07503030449151993, 0.07050192356109619, 0.07955868542194366, 0.07323067635297775, 0.07581526786088943]
13/13 [==============================] - 0s 2ms/step - loss: 0.0790 - xy_loss: 0.0700 - theta_loss: 0.0880 - xy_xy_metric: 0.0703 - theta_theta_metric: 0.0922
Mean Squared Error:  [0.07899323850870132, 0.06995762884616852, 0.08802884817123413, 0.07031135261058807, 0.09224580228328705]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2834422448627571 meters
Mean squared error for test data (degrees):  0.28963578661637973 radians
####################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3693309234880205, shape=(), dtype=float64) meters
```





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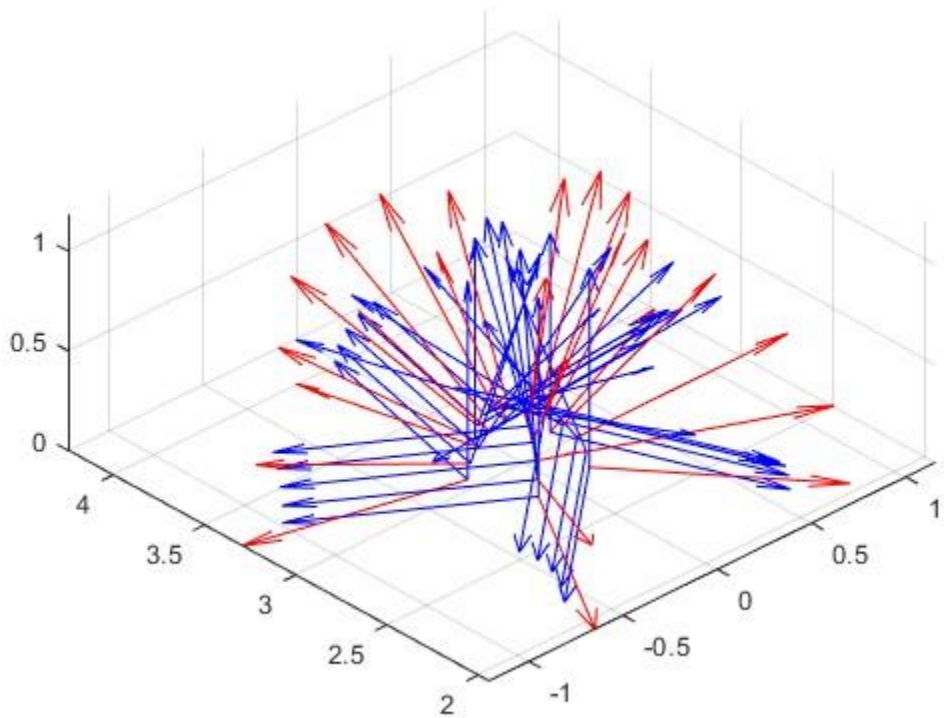

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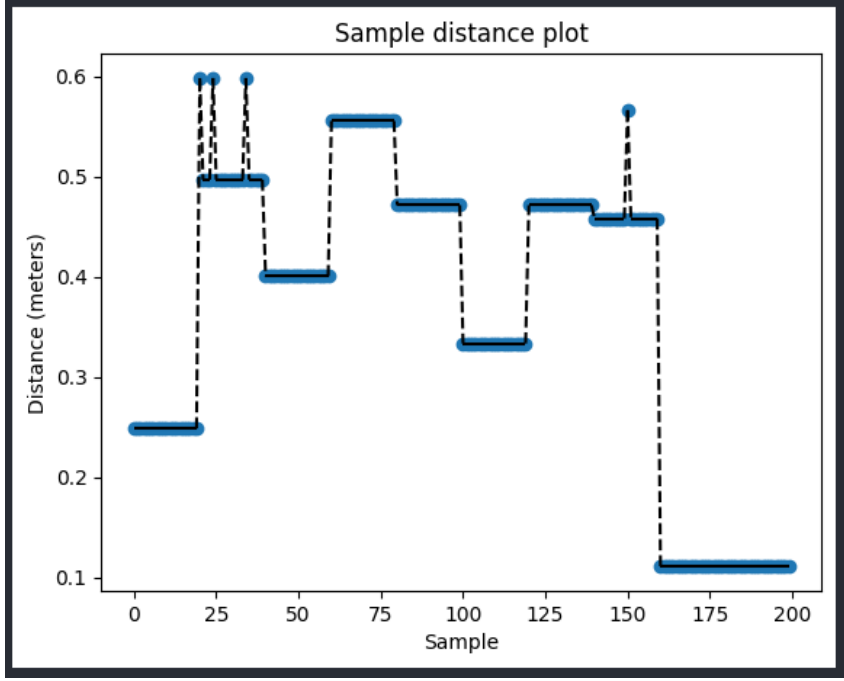
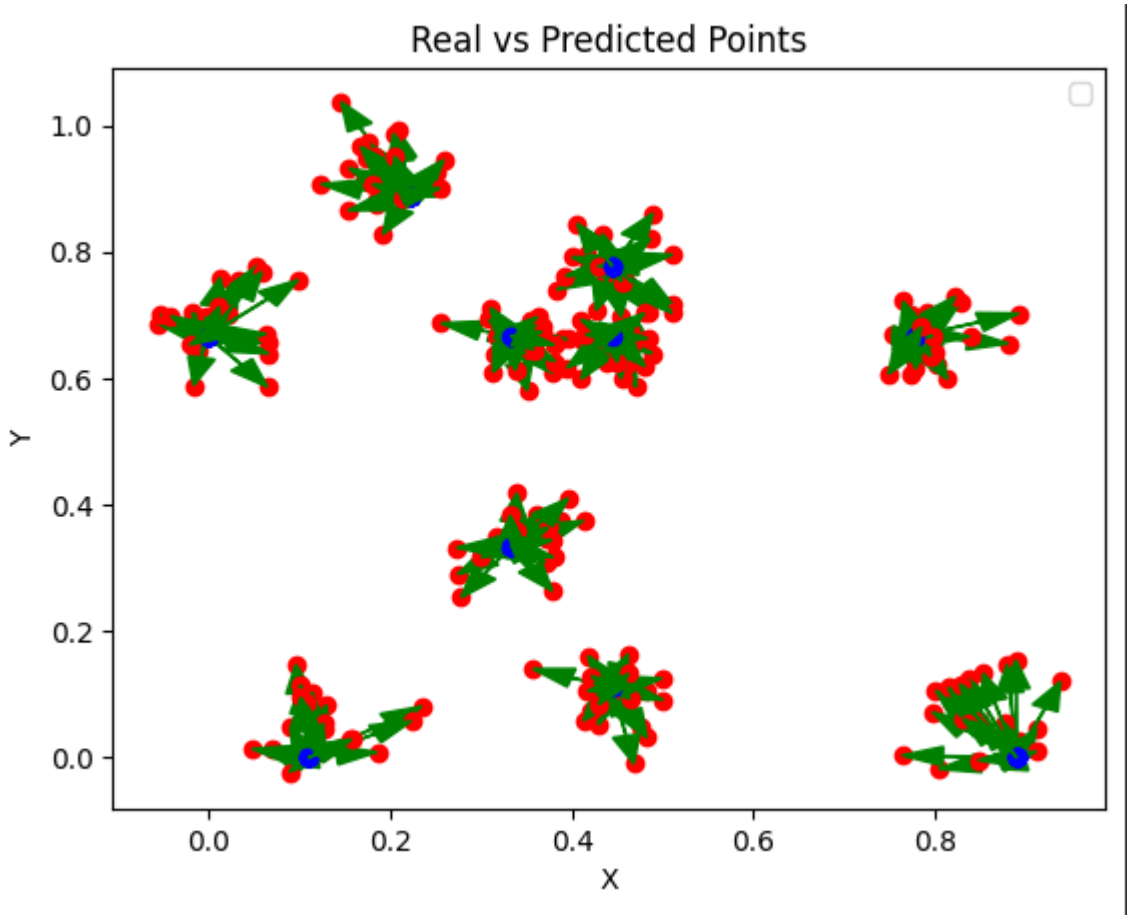
Model 1

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0722 - xy_loss: 0.0621 - theta_loss: 0.0823 - xy_xy_metric: 0.0648 - theta_theta_metric: 0.0902
Mean Squared Error:  [0.07220043241977692, 0.062131766229867935, 0.0822690948843956, 0.06476730108261108, 0.09023816138505936]
13/13 [==============================] - 0s 2ms/step - loss: 0.0763 - xy_loss: 0.0617 - theta_loss: 0.0908 - xy_xy_metric: 0.0634 - theta_theta_metric: 0.0942
Mean Squared Error:  [0.07628205418586731, 0.061720892786979675, 0.09084320813417435, 0.06344927102327347, 0.09418480098247528]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.28196838978776645 meters
Mean squared error for test data (degrees):  0.23921166824012258 radians
####################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3678654692226506, shape=(), dtype=float64) meters
```





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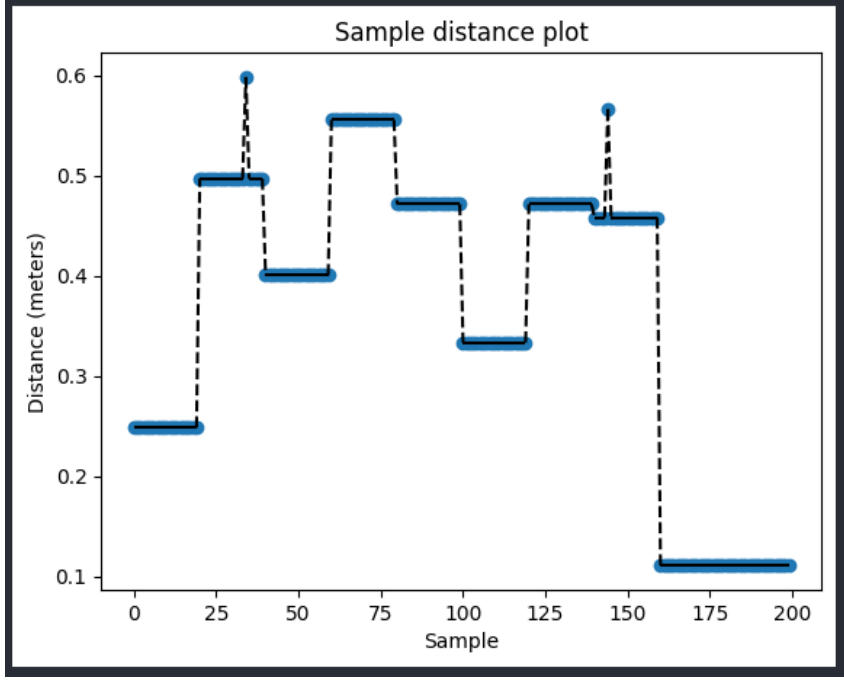
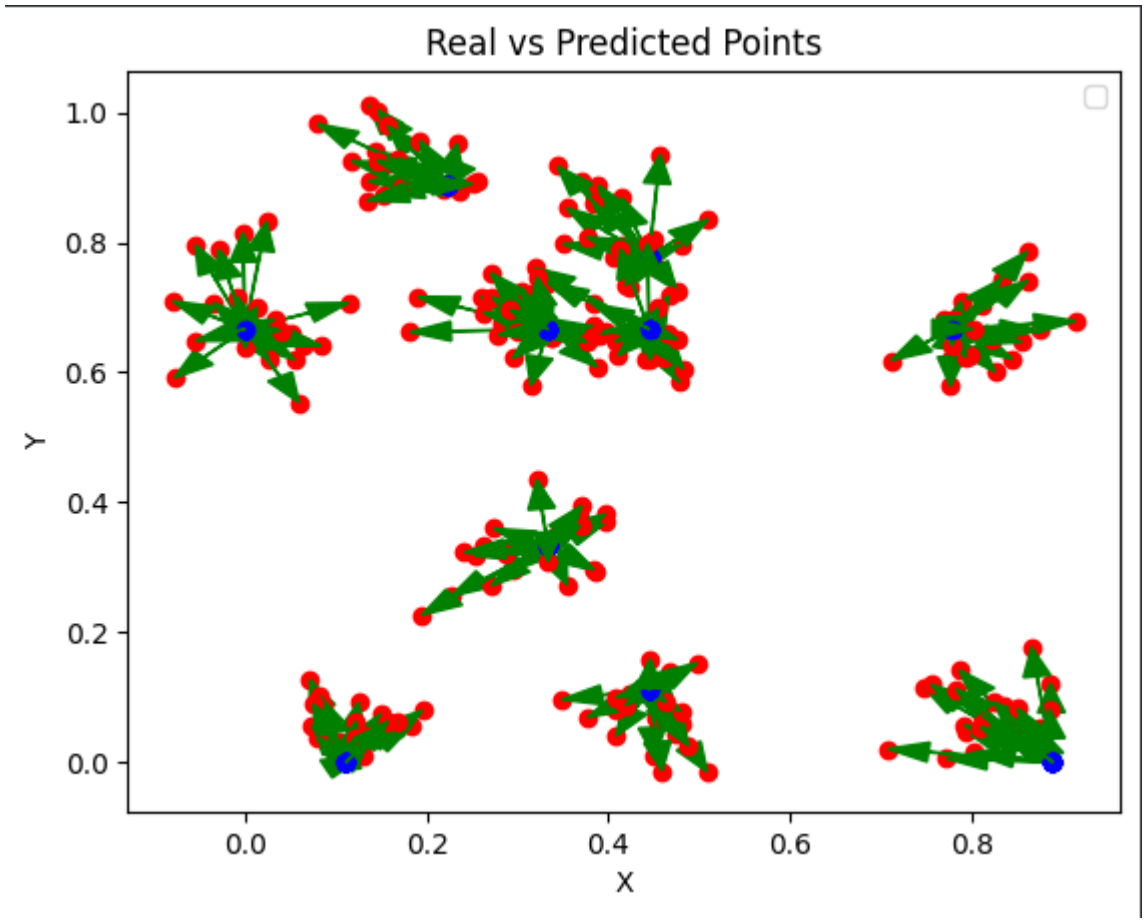
Model 2

```
7/7 [==============================] - 0s 3ms/step - loss: 0.1141 - xy_loss: 0.0785 - theta_loss: 0.1497 - xy_xy_metric: 0.0788 - theta_theta_metric: 0.1509
Mean Squared Error:  [0.11406969279050827, 0.07848334312438965, 0.1496560424566269, 0.07875921577215195, 0.15087929368019104]
13/13 [==============================] - 0s 2ms/step - loss: 0.1201 - xy_loss: 0.0748 - theta_loss: 0.1655 - xy_xy_metric: 0.0773 - theta_theta_metric: 0.1685
Mean Squared Error:  [0.1201494112610817, 0.0748470202088356, 0.16545182466506958, 0.07727669924497604, 0.1684790998697281]
```

```
7/7 [==============================] - 0s 2ms/step
Mean Error for test data (distance):  0.280981524808928 meters
Mean squared error for test data (degrees):  0.29533408577782283 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.36685099272027843, shape=(), dtype=float64) meters
```





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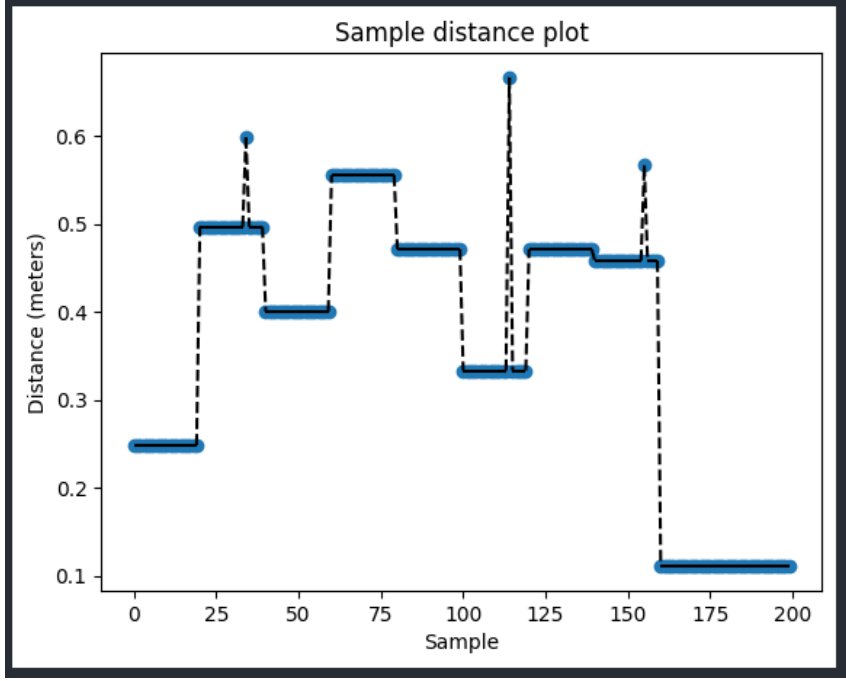
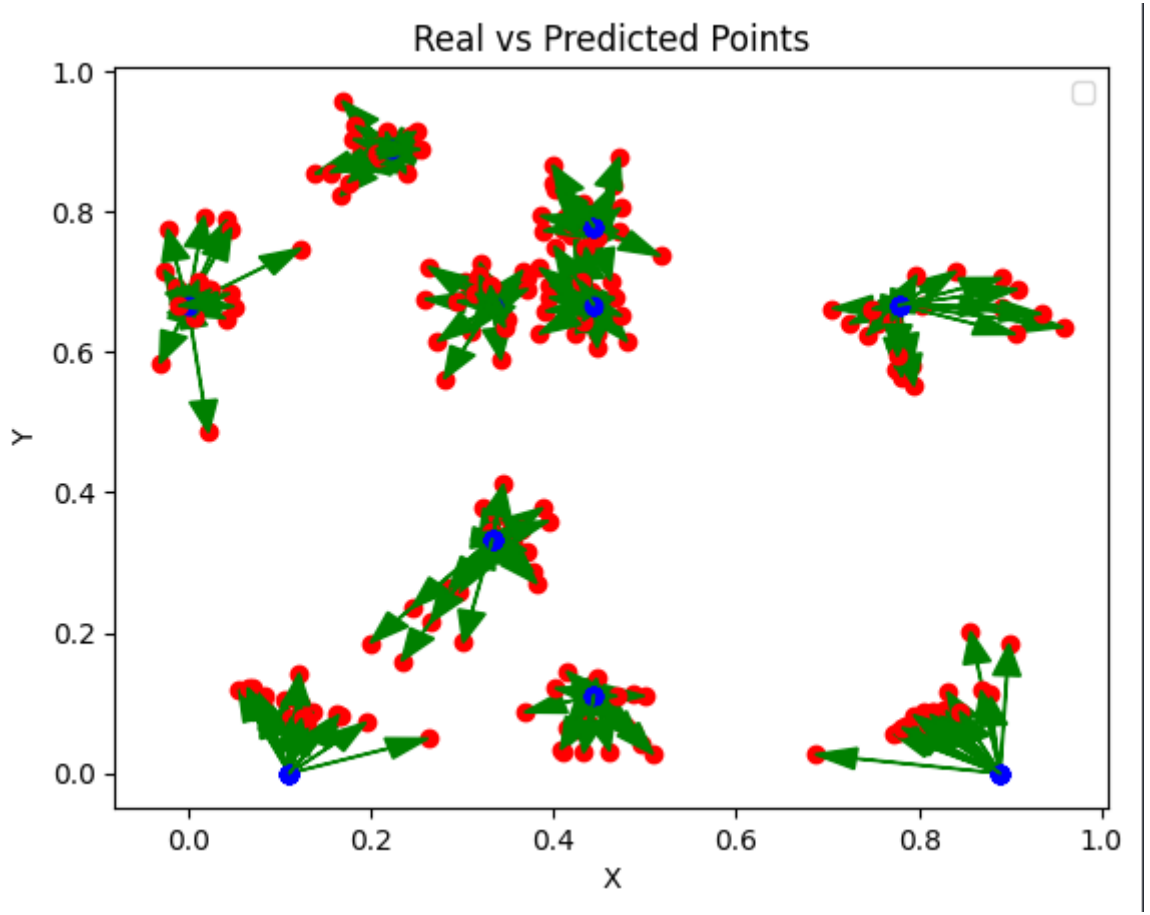
Model 3

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1736 - xy_loss: 0.0718 - theta_loss: 0.2754 - xy_xy_metric: 0.0759 - theta_theta_metric: 0.2637
Mean Squared Error:  [0.1735670268535614, 0.07177005708217621, 0.2753640115261078, 0.07589664310216904, 0.2637304663658142]
13/13 [==============================] - 0s 2ms/step - loss: 0.1689 - xy_loss: 0.0773 - theta_loss: 0.2606 - xy_xy_metric: 0.0801 - theta_theta_metric: 0.2580
Mean Squared Error:  [0.1689079999923706, 0.07726302742958069, 0.2605530023574829, 0.08008354157209396, 0.25795724987983704]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2824605293085807 meters
Mean squared error for test data (degrees):  0.5343739847293799 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.36851765938694503, shape=(), dtype=float64) meters
```





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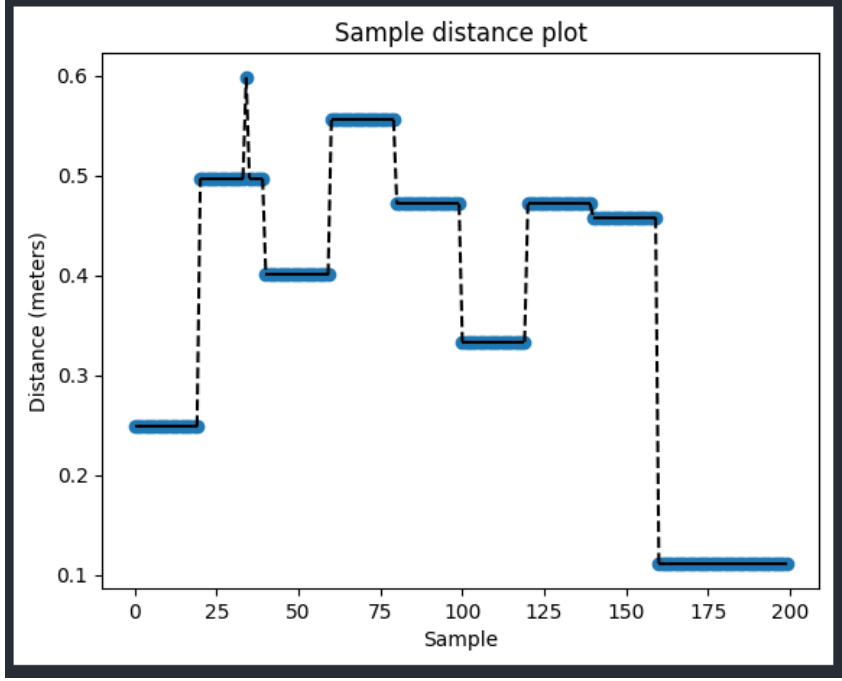
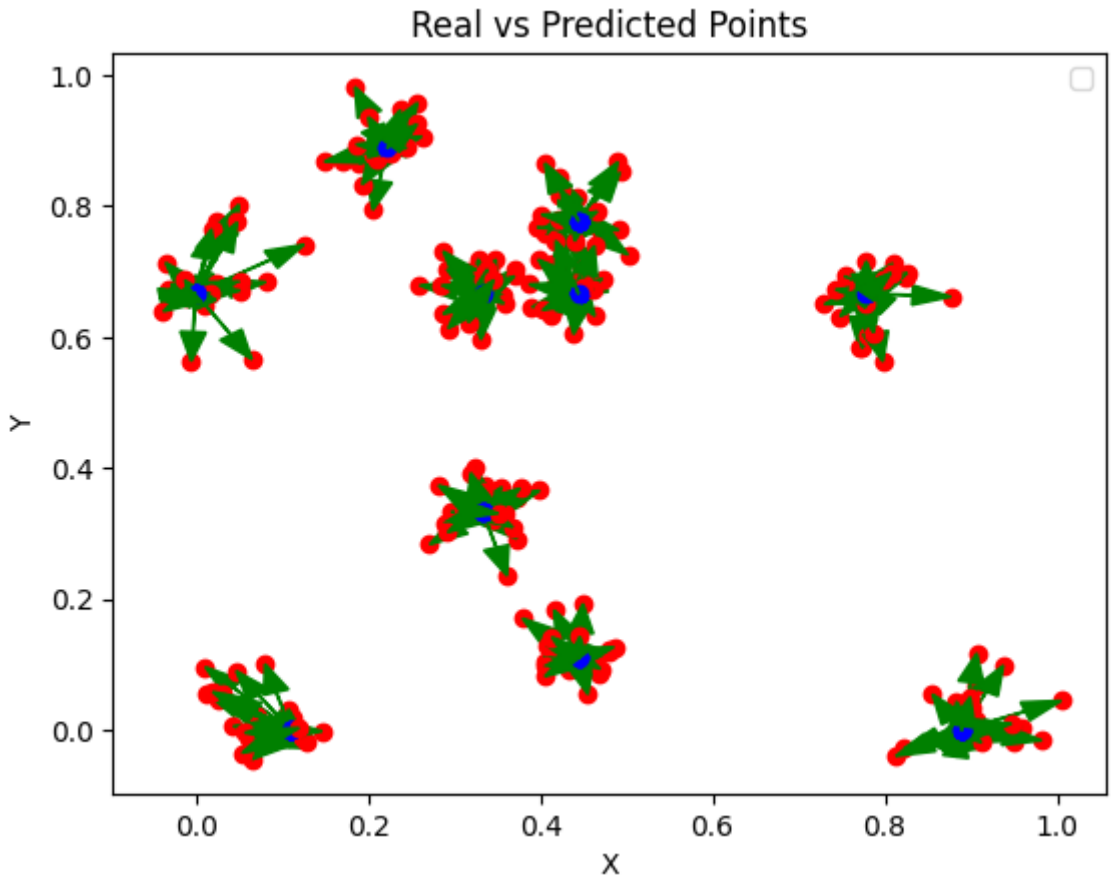
Model 4

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1891 - xy_loss: 0.0522 - theta_loss: 0.3260 - xy_xy_metric: 0.0524 - theta_theta_metric: 0.3487
Mean Squared Error:  [0.1891079694032669, 0.05222393199801445, 0.32599198818206787, 0.05238797515630722, 0.3486652970314026]
13/13 [==============================] - 0s 2ms/step - loss: 0.1927 - xy_loss: 0.0581 - theta_loss: 0.3273 - xy_xy_metric: 0.0589 - theta_theta_metric: 0.3276
Mean Squared Error:  [0.19271764159202576, 0.05812143161892891, 0.32731392979621887, 0.0589492991566658, 0.327632874250412]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.28048679025254014 meters
Mean squared error for test data (degrees):  0.5948856099191582 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.36630881833807005, shape=(), dtype=float64) meters
```





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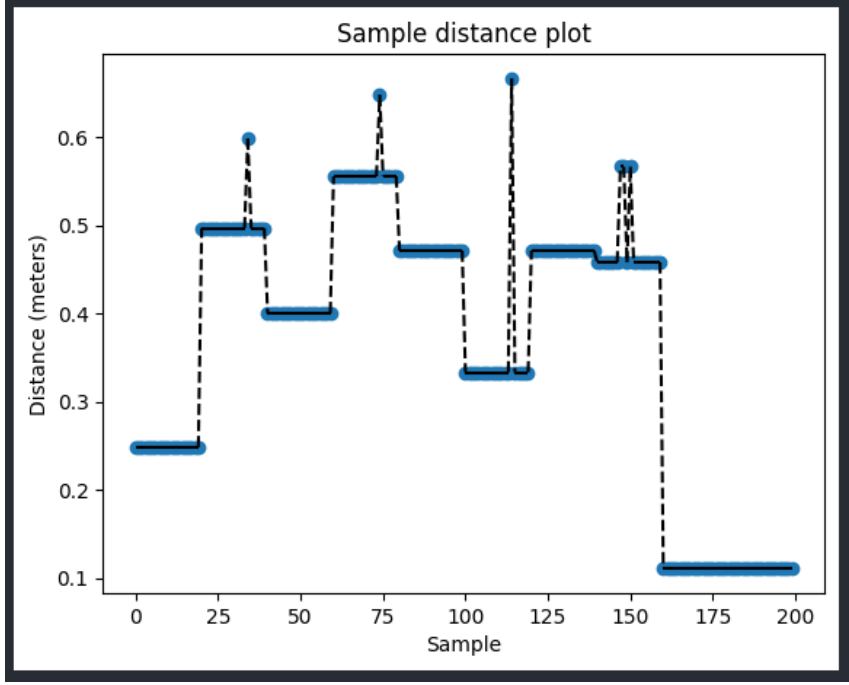
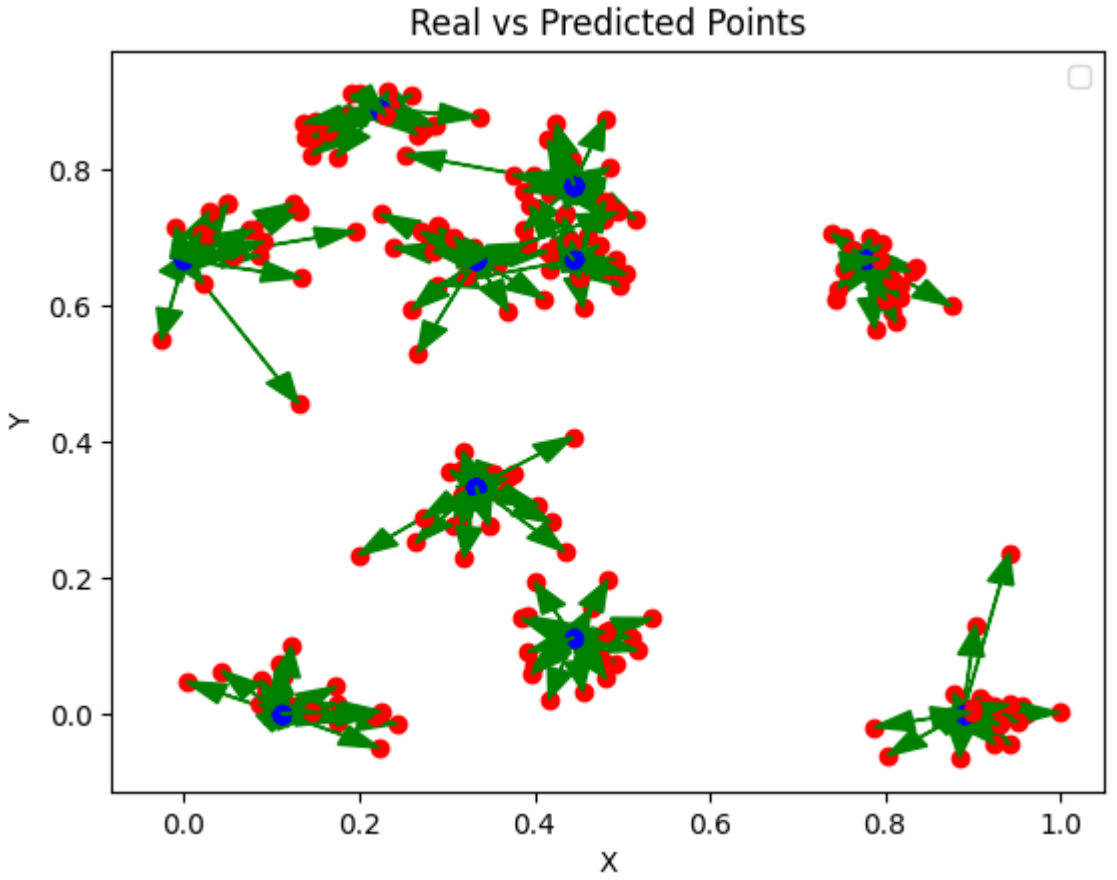
Model 5

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0759 - xy_loss: 0.0667 - theta_loss: 0.0851 - xy_xy_metric: 0.0692 - theta_theta_metric: 0.0850
Mean Squared Error:  [0.07590474933385849, 0.06668364256620407, 0.0851258635520935, 0.06921671330928802, 0.0849863663315773]
13/13 [==============================] - 0s 2ms/step - loss: 0.0884 - xy_loss: 0.0710 - theta_loss: 0.1057 - xy_xy_metric: 0.0719 - theta_theta_metric: 0.1095
Mean Squared Error:  [0.08836207538843155, 0.07098065316677094, 0.10574349761009216, 0.07192372530698776, 0.10954882204532623]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.2839318297595691 meters
Mean squared error for test data (degrees):  0.2624669291337274 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3700636480929427, shape=(), dtype=float64) meters
```





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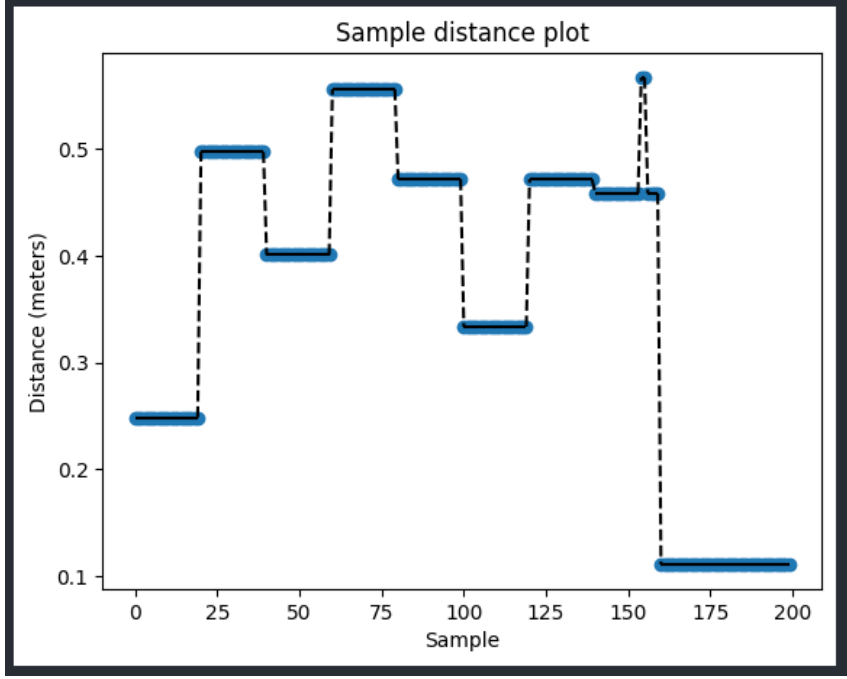
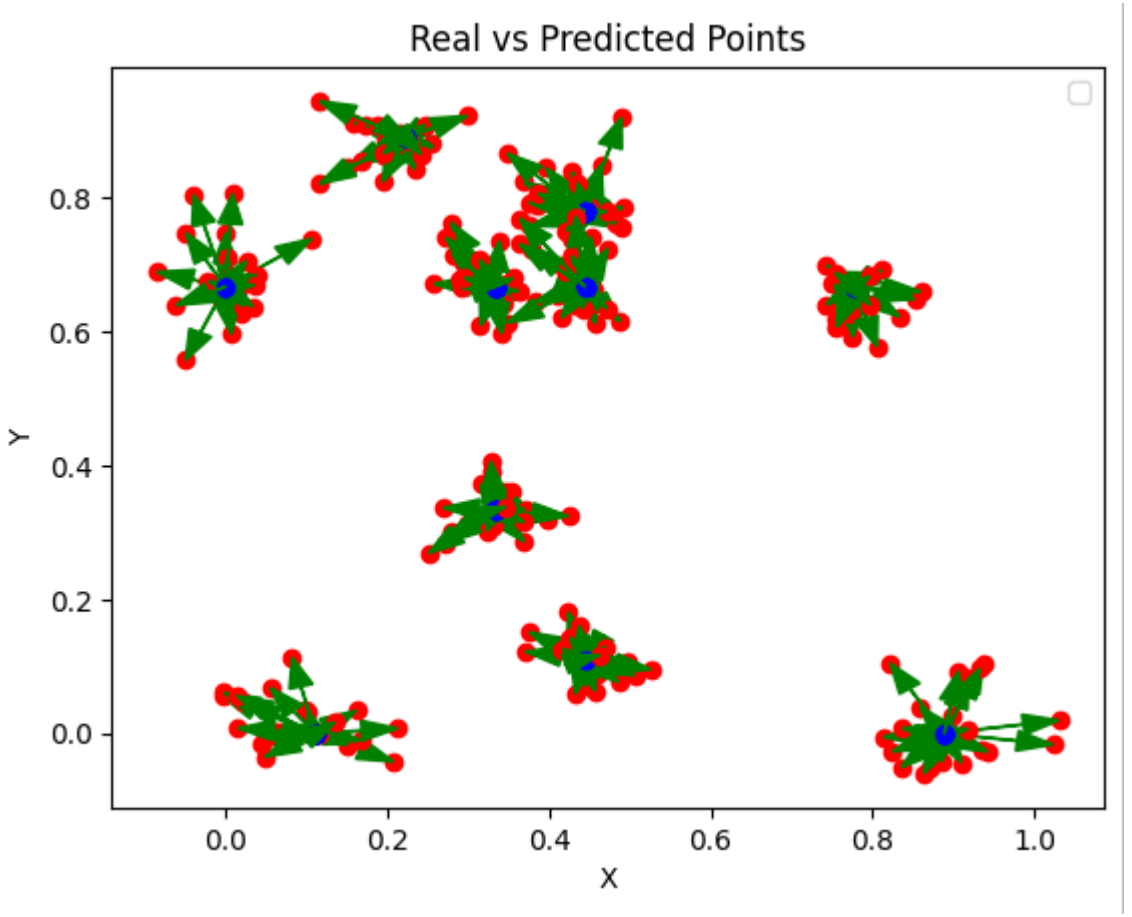
Model 6

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0630 - xy_loss: 0.0583 - theta_loss: 0.0677 - xy_xy_metric: 0.0608 - theta_theta_metric: 0.0693
Mean Squared Error:  [0.06303418427705765, 0.05834252014756203, 0.06772584468126297, 0.06081566587090492, 0.0692763552069664]
13/13 [==============================] - 0s 2ms/step - loss: 0.0695 - xy_loss: 0.0629 - theta_loss: 0.0761 - xy_xy_metric: 0.0642 - theta_theta_metric: 0.0797
Mean Squared Error:  [0.06948505342006683, 0.06289536505937576, 0.0760747417807579, 0.06417445838451385, 0.0796983391046524]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.280981524808928 meters
Mean squared error for test data (degrees):  0.26562295750848747 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3668859288513008, shape=(), dtype=float64) meters
```





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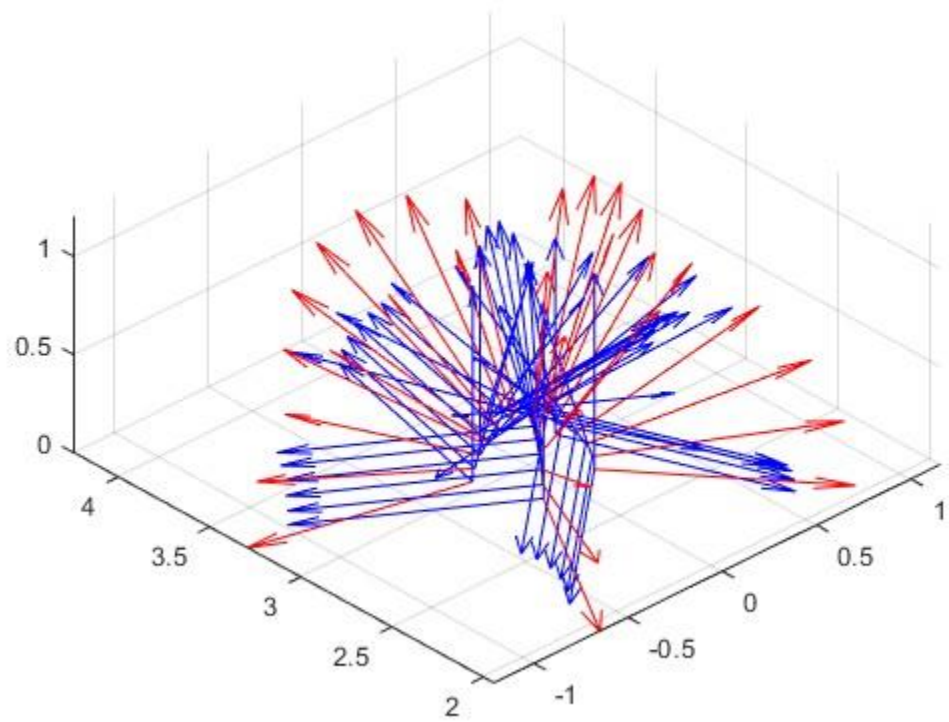

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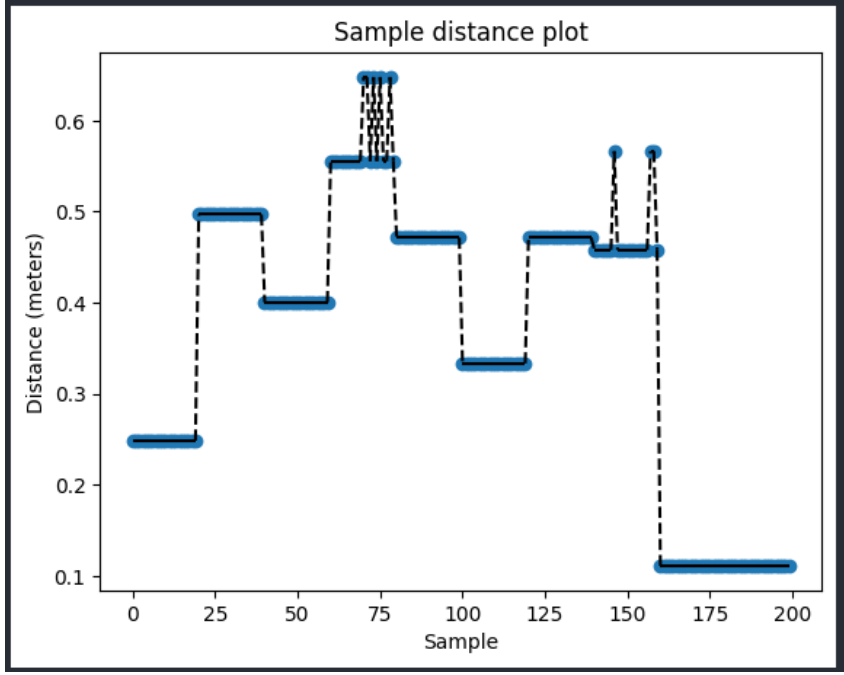
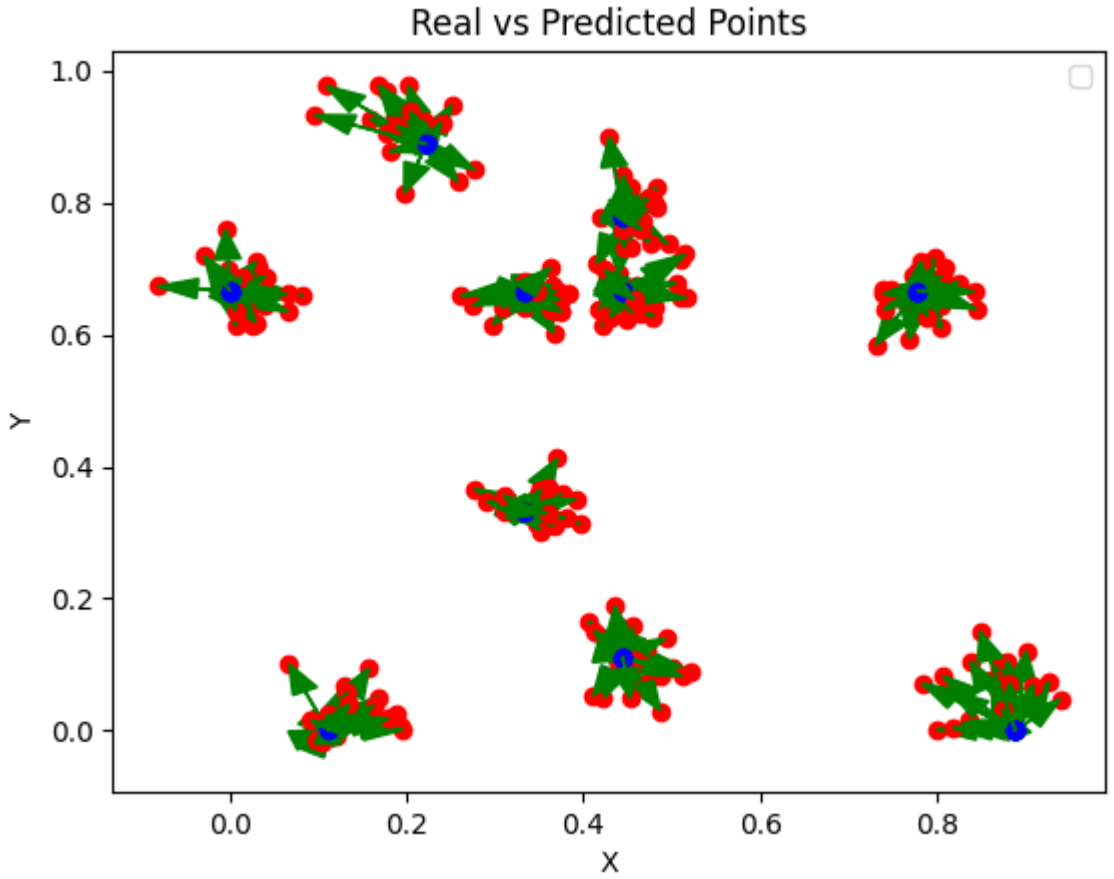
Model 1

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0595 - xy_loss: 0.0538 - theta_loss: 0.0653 - xy_xy_metric: 0.0536 - theta_theta_metric: 0.0765
Mean Squared Error:  [0.059530943632125854, 0.053768232464790344, 0.06529366225004196, 0.05359356477856636, 0.07654254883527756]
13/13 [==============================] - 0s 2ms/step - loss: 0.0641 - xy_loss: 0.0578 - theta_loss: 0.0704 - xy_xy_metric: 0.0589 - theta_theta_metric: 0.0752
Mean Squared Error:  [0.0640946626663208, 0.05778256431221962, 0.07040674984455109, 0.05890262871980667, 0.07517952471971512]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.28393182975956904 meters
Mean squared error for test data (degrees):  0.23921166824012258 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.36973630294141285, shape=(), dtype=float64) meters
```





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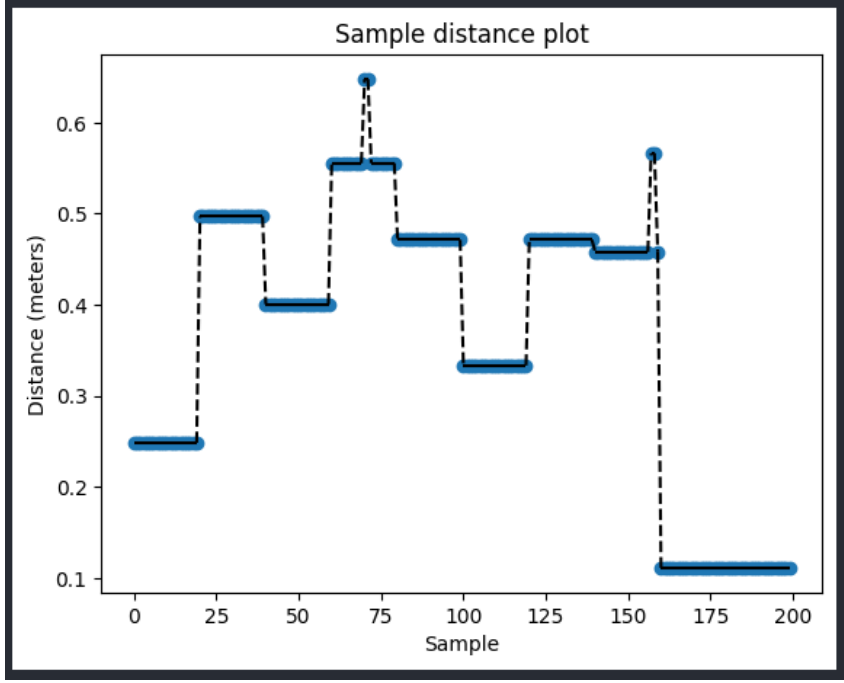
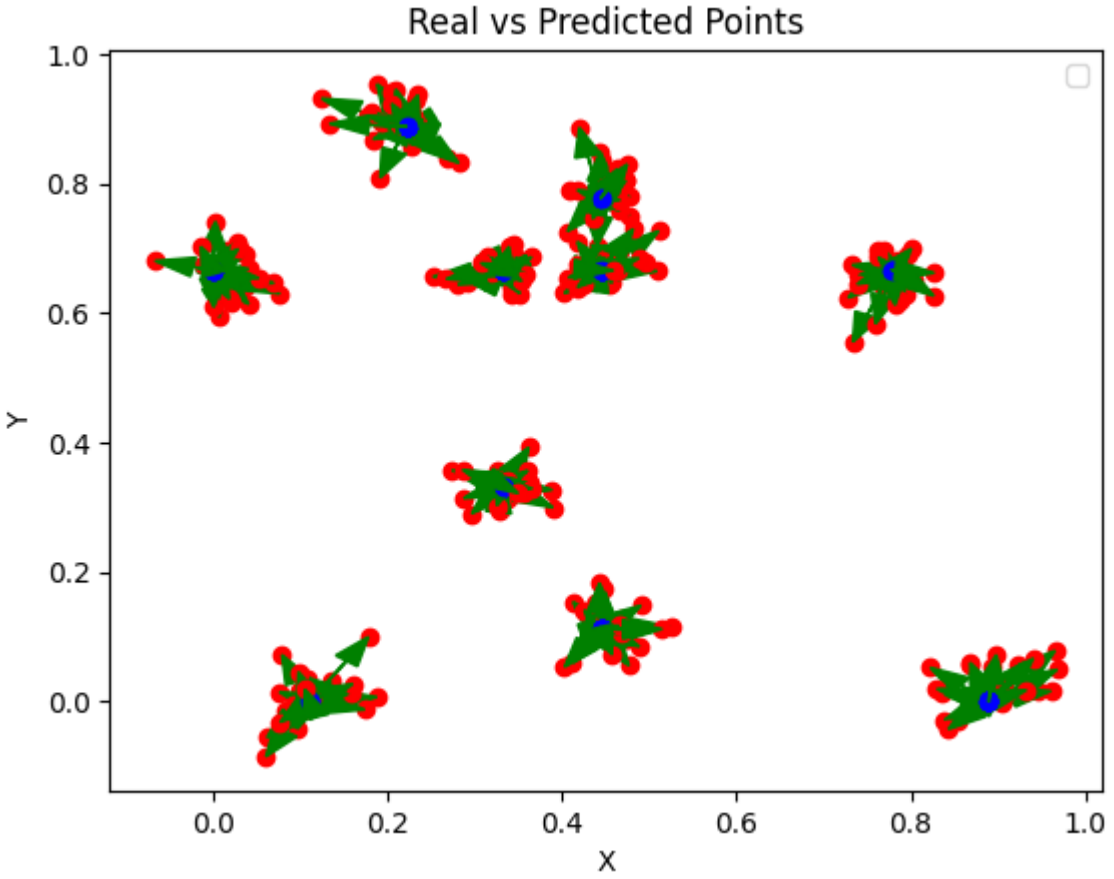
Model 2

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0583 - xy_loss: 0.0459 - theta_loss: 0.0706 - xy_xy_metric: 0.0465 - theta_theta_metric: 0.0779
Mean Squared Error:  [0.05827905610203743, 0.04591839015483856, 0.0706397294998169, 0.046528298407793045, 0.07790043205022812]
13/13 [==============================] - 0s 2ms/step - loss: 0.0643 - xy_loss: 0.0542 - theta_loss: 0.0743 - xy_xy_metric: 0.0542 - theta_theta_metric: 0.0793
Mean Squared Error:  [0.06425809115171432, 0.054248277097940445, 0.0742679163813591, 0.054185740649700165, 0.07932892441749573]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.28196838978776645 meters
Mean squared error for test data (degrees):  0.24267032964268442 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3678092087344622, shape=(), dtype=float64) meters
```





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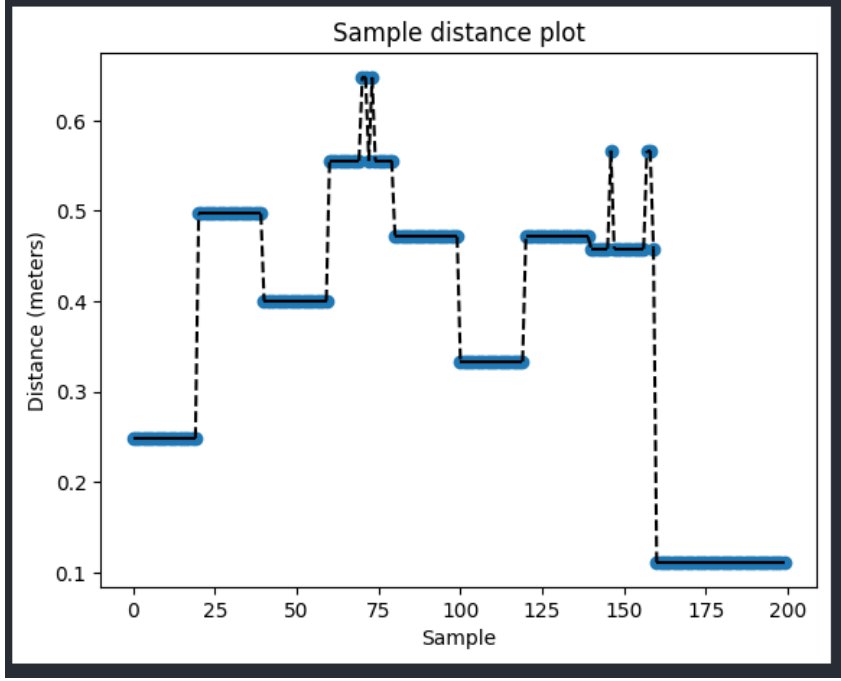
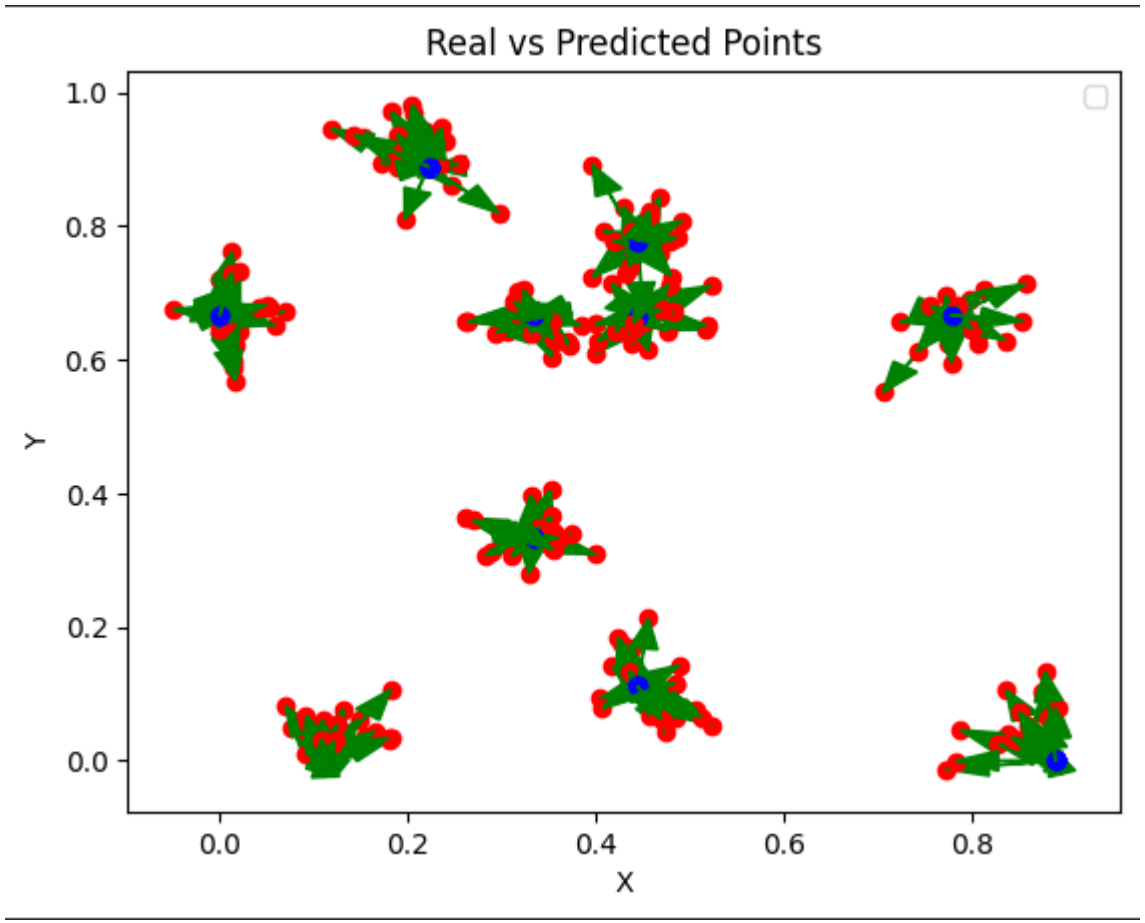
Model 3

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0815 - xy_loss: 0.0532 - theta_loss: 0.1098 - xy_xy_metric: 0.0535 - theta_theta_metric: 0.1125
Mean Squared Error:  [0.08147341758012772, 0.0531882718205452, 0.10975857079029083, 0.053495414555072784, 0.11249957233667374]
13/13 [==============================] - 0s 2ms/step - loss: 0.0871 - xy_loss: 0.0584 - theta_loss: 0.1158 - xy_xy_metric: 0.0600 - theta_theta_metric: 0.1197
Mean Squared Error:  [0.08712733536958694, 0.05842001736164093, 0.11583464592695236, 0.059953074902296066, 0.11974486708641052]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.28295181284992915 meters
Mean squared error for test data (degrees):  0.24608038433722382 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3688130230582514, shape=(), dtype=float64) meters
```





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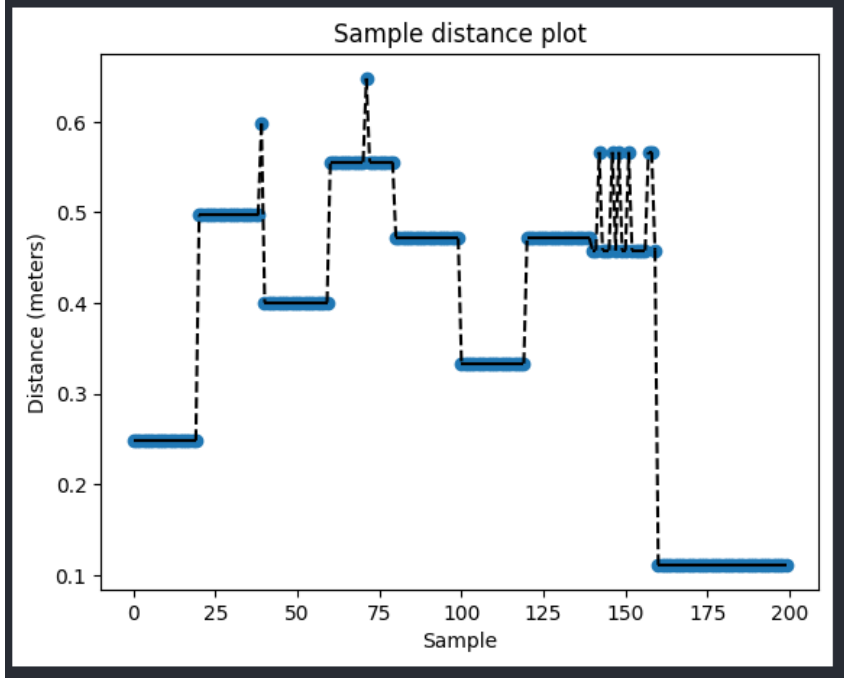
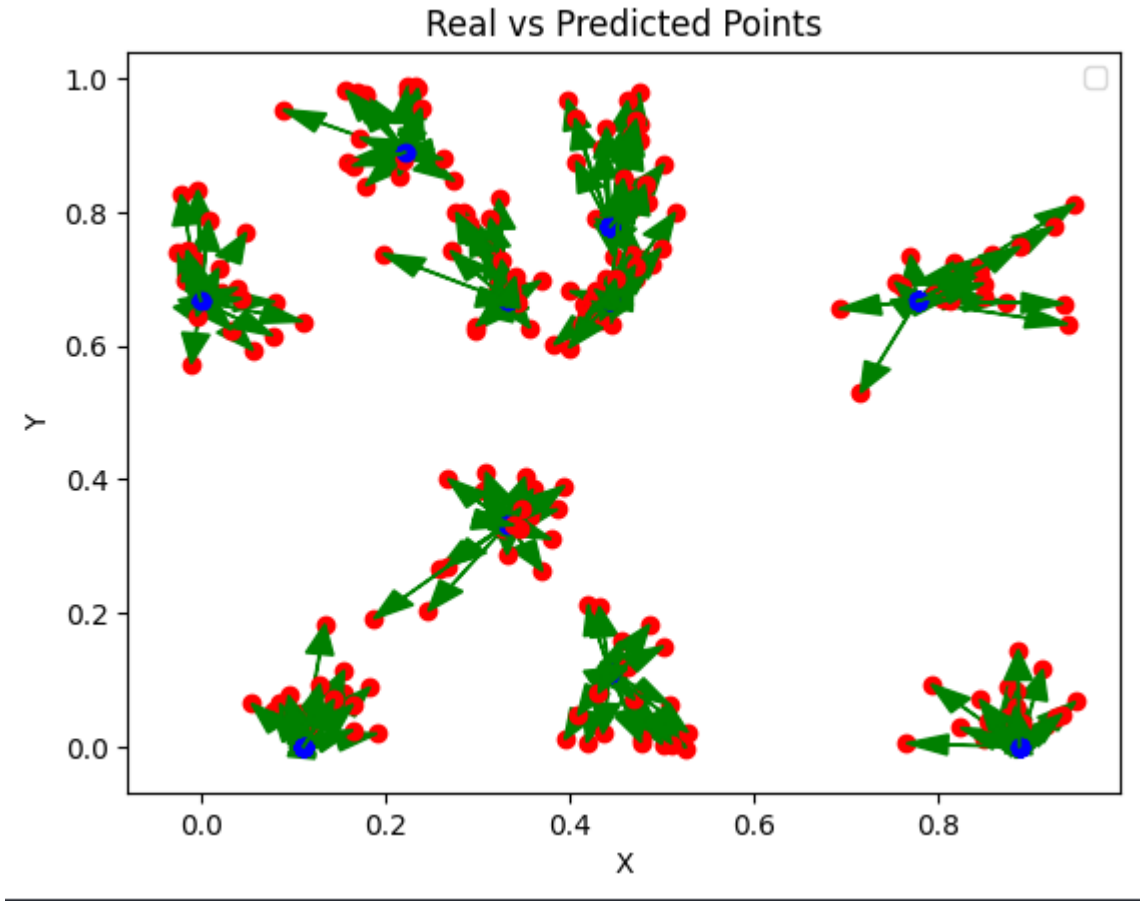
Model 4

```
7/7 [==============================] - 0s 2ms/step - loss: 0.1088 - xy_loss: 0.0821 - theta_loss: 0.1356 - xy_xy_metric: 0.0827 - theta_theta_metric: 0.1303
Mean Squared Error:  [0.1088489517569542, 0.08209773153066635, 0.13560017943382263, 0.08265416324138641, 0.130263552069664]
13/13 [==============================] - 0s 2ms/step - loss: 0.1075 - xy_loss: 0.0724 - theta_loss: 0.1426 - xy_xy_metric: 0.0725 - theta_theta_metric: 0.1473
Mean Squared Error:  [0.10752079635858536, 0.07241755723953247, 0.14262405037879944, 0.07250792533159256, 0.14733248949050903]
```

```
7/7 [==============================] - 0s 921us/step
Mean Error for test data (distance):  0.2839318297595691 meters
Mean squared error for test data (degrees):  0.26246692913372743 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3700235045729013, shape=(), dtype=float64) meters
```





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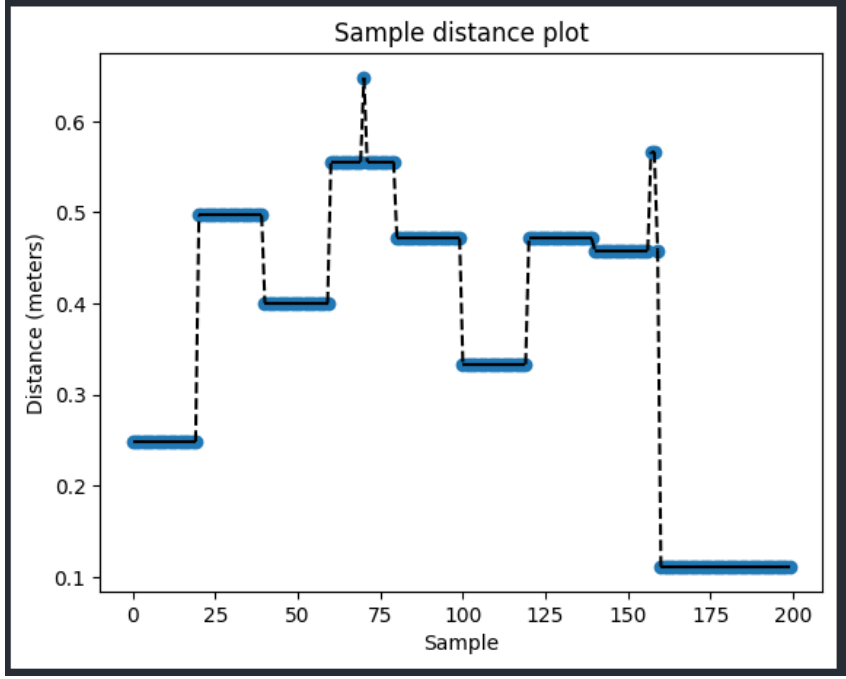
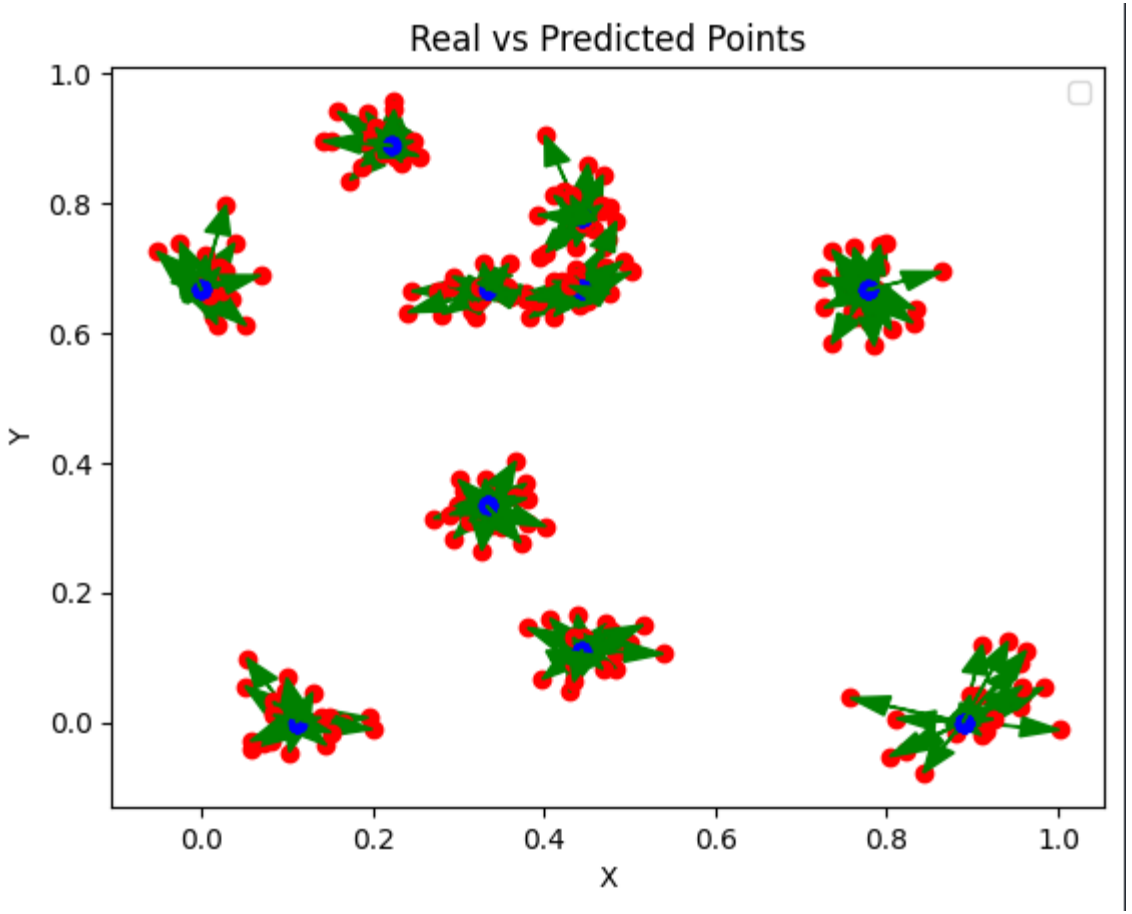
Model 5

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0602 - xy_loss: 0.0516 - theta_loss: 0.0688 - xy_xy_metric: 0.0515 - theta_theta_metric: 0.0773
Mean Squared Error:  [0.060208845883607864, 0.05158955603837967, 0.06882812827825546, 0.05154800415039062, 0.07725608348846436]
13/13 [==============================] - 0s 3ms/step - loss: 0.0638 - xy_loss: 0.0524 - theta_loss: 0.0751 - xy_xy_metric: 0.0526 - theta_theta_metric: 0.0781
Mean Squared Error:  [0.0637621283531189, 0.05238869786262512, 0.07513555139303207, 0.05257953703403473, 0.07807081192731857]
```

```
7/7 [==============================] - 0s 1000us/step
Mean Error for test data (distance):  0.2814753897976304 meters
Mean squared error for test data (degrees):  0.24267032964268442 radians
##################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.3673475687928815, shape=(), dtype=float64) meters
```





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Model 6

```
7/7 [==============================] - 0s 2ms/step - loss: 0.0636 - xy_loss: 0.0532 - theta_loss: 0.0741 - xy_xy_metric: 0.0527 - theta_theta_metric: 0.0887
Mean Squared Error:  [0.0636308565735817, 0.053190674632787704, 0.07407103478908539, 0.05271052196621895, 0.08865141868591309]
13/13 [==============================] - 0s 2ms/step - loss: 0.0670 - xy_loss: 0.0545 - theta_loss: 0.0794 - xy_xy_metric: 0.0550 - theta_theta_metric: 0.0827
Mean Squared Error:  [0.06695647537708282, 0.054520487785339355, 0.0793924629688263, 0.05498351529240608, 0.08273646235466003]
```

```
7/7 [==============================] - 0s 1ms/step
Mean Error for test data (distance):  0.28295181284992915 meters
Mean squared error for test data (degrees):  0.2687419249432853 radians
##########################################################################################################################
Mean Error for test data (distance):  tf.Tensor(0.36889355749887903, shape=(), dtype=float64) meters
```