About Displacement

Works' name

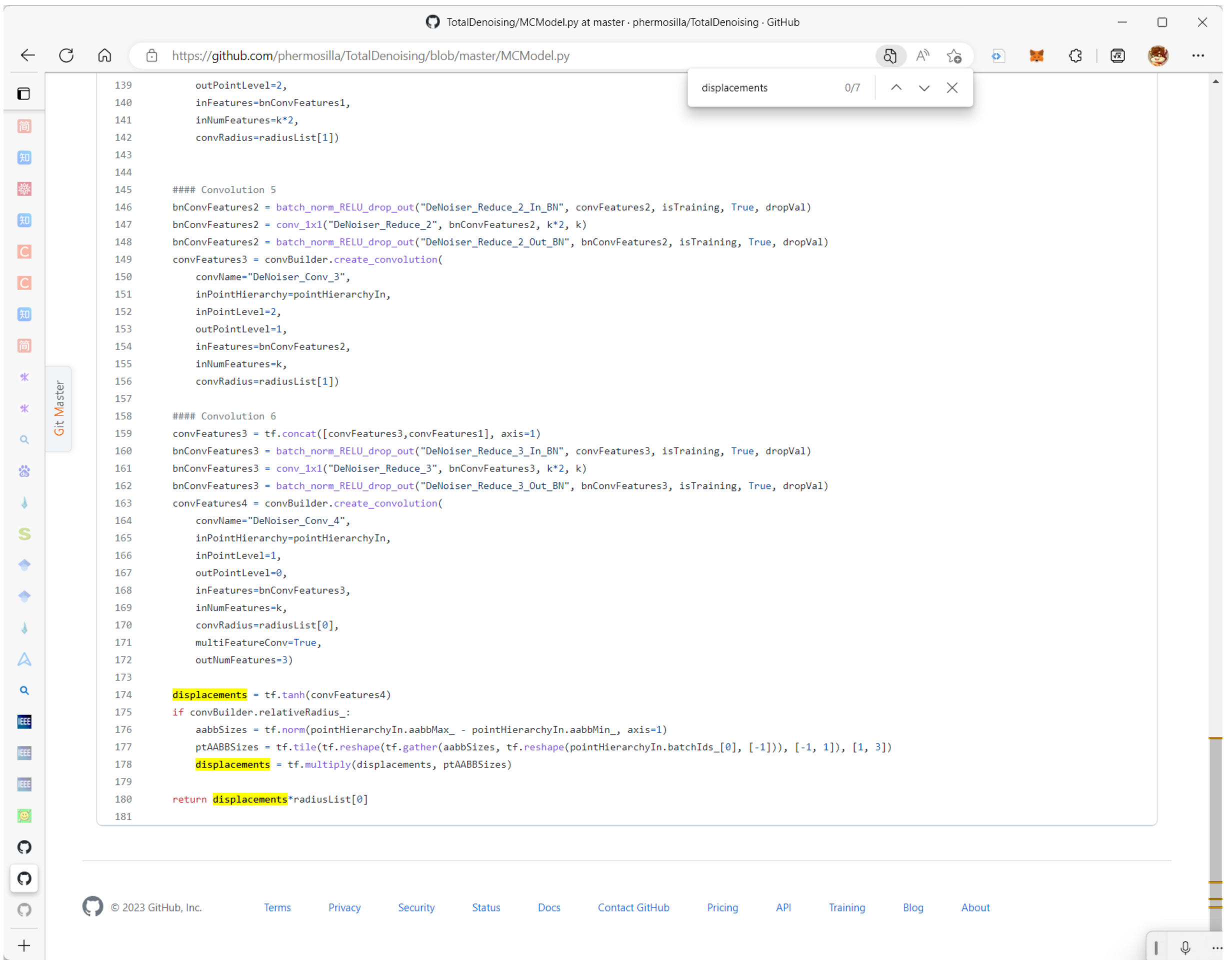
Net Name	Paper Name
PCN	POINTCLEANNET: Learning to Denoise and Remove Outliers from Dense Point Clouds
Total	Total Denoising: Unsupervised Learning of 3D Point Cloud Cleaning
3DPCD	3D POINT CLOUD DENOISING VIA DEEP NEURAL NETWORK BASED LOCAL SURFACE ESTIMATION
GPDNet	Learning Graph-Convolutional Representations for Point Cloud Denoising

About

Net Name	Output	Target
PCN	Point	Point Min length
Total	Displacement	compare (Input Point + Displacement) & GT
3DPCD	404	404
GPDNet	noise (same as displacement)	compare(MSE) (Input Point - ϵ noise) & GT

Code

Total


TotalDenoising/MCModel.py at master · phermosilla/TotalDenoising · GitHub

https://github.com/phermosilla/TotalDenoising/blob/master/MCModel.py

displacements 0/7

```python
            outPointLevel=2,
            inFeatures=bnConvFeatures1,
            inNumFeatures=k*2,
            convRadius=radiusList[1])


        #### Convolution 5
        bnConvFeatures2 = batch_norm_RELU_drop_out("DeNoiser_Reduce_2_In_BN", convFeatures2, isTraining, True, dropVal)
        bnConvFeatures2 = conv_1x1("DeNoiser_Reduce_2", bnConvFeatures2, k*2, k)
        bnConvFeatures2 = batch_norm_RELU_drop_out("DeNoiser_Reduce_2_Out_BN", bnConvFeatures2, isTraining, True, dropVal)
        convFeatures3 = convBuilder.create_convolution(
            convName="DeNoiser_Conv_3",
            inPointHierarchy=pointHierarchyIn,
            inPointLevel=2,
            outPointLevel=1,
            inFeatures=bnConvFeatures2,
            inNumFeatures=k,
            convRadius=radiusList[1])

        #### Convolution 6
        convFeatures3 = tf.concat([convFeatures3,convFeatures1], axis=1)
        bnConvFeatures3 = batch_norm_RELU_drop_out("DeNoiser_Reduce_3_In_BN", convFeatures3, isTraining, True, dropVal)
        bnConvFeatures3 = conv_1x1("DeNoiser_Reduce_3", bnConvFeatures3, k*2, k)
        bnConvFeatures3 = batch_norm_RELU_drop_out("DeNoiser_Reduce_3_Out_BN", bnConvFeatures3, isTraining, True, dropVal)
        convFeatures4 = convBuilder.create_convolution(
            convName="DeNoiser_Conv_4",
            inPointHierarchy=pointHierarchyIn,
            inPointLevel=1,
            outPointLevel=0,
            inFeatures=bnConvFeatures3,
            inNumFeatures=k,
            convRadius=radiusList[0],
            multiFeatureConv=True,
            outNumFeatures=3)

        displacements = tf.tanh(convFeatures4)
        if convBuilder.relativeRadius_:
            aabbSizes = tf.norm(pointHierarchyIn.aabbMax_ - pointHierarchyIn.aabbMin_, axis=1)
            ptAABBSizes = tf.tile(tf.reshape(tf.gather(aabbSizes, tf.reshape(pointHierarchyIn.batchIds_[0], [-1])), [-1, 1]), [1, 3])
            displacements = tf.multiply(displacements, ptAABBSizes)

        return displacements*radiusList[0]
```

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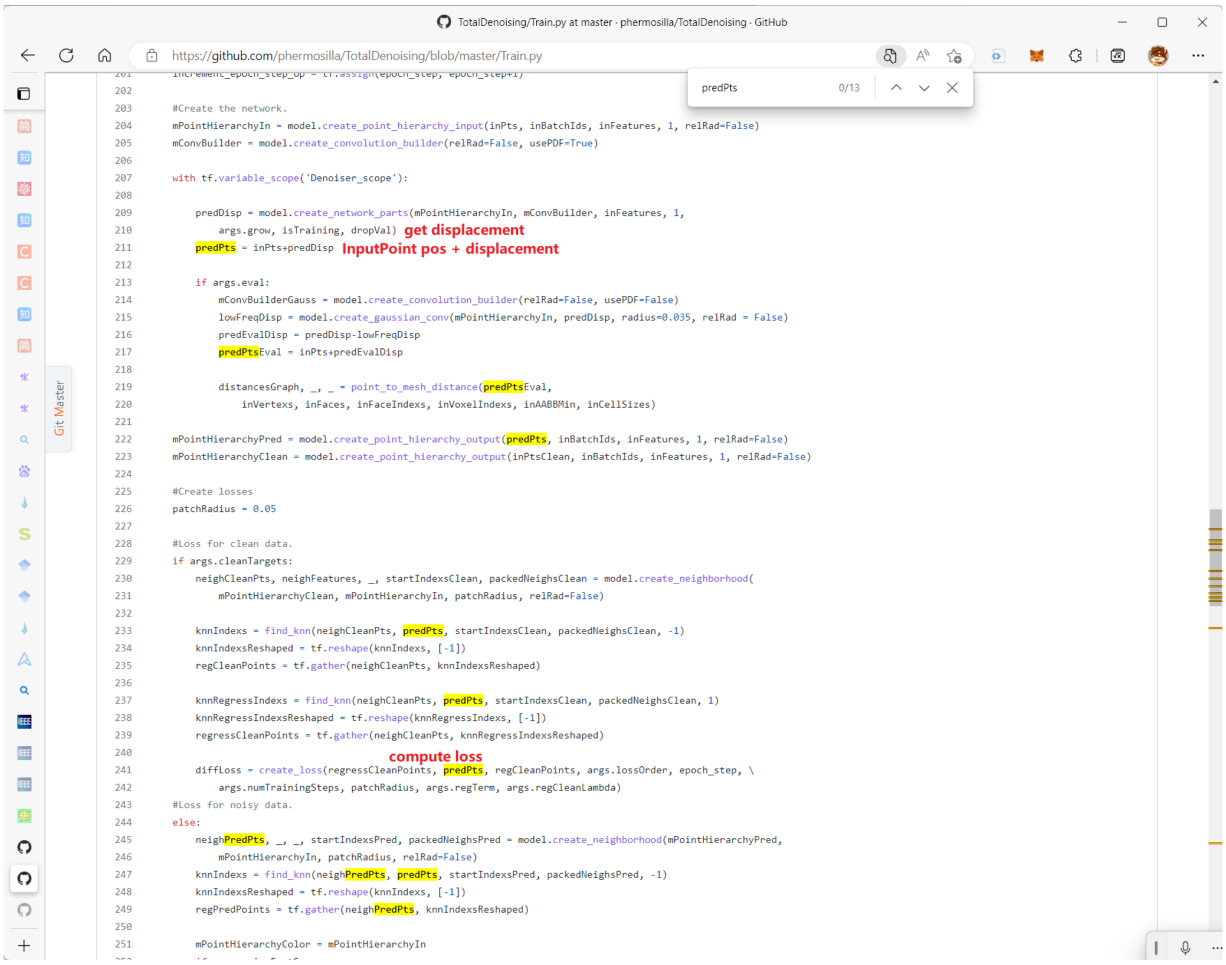
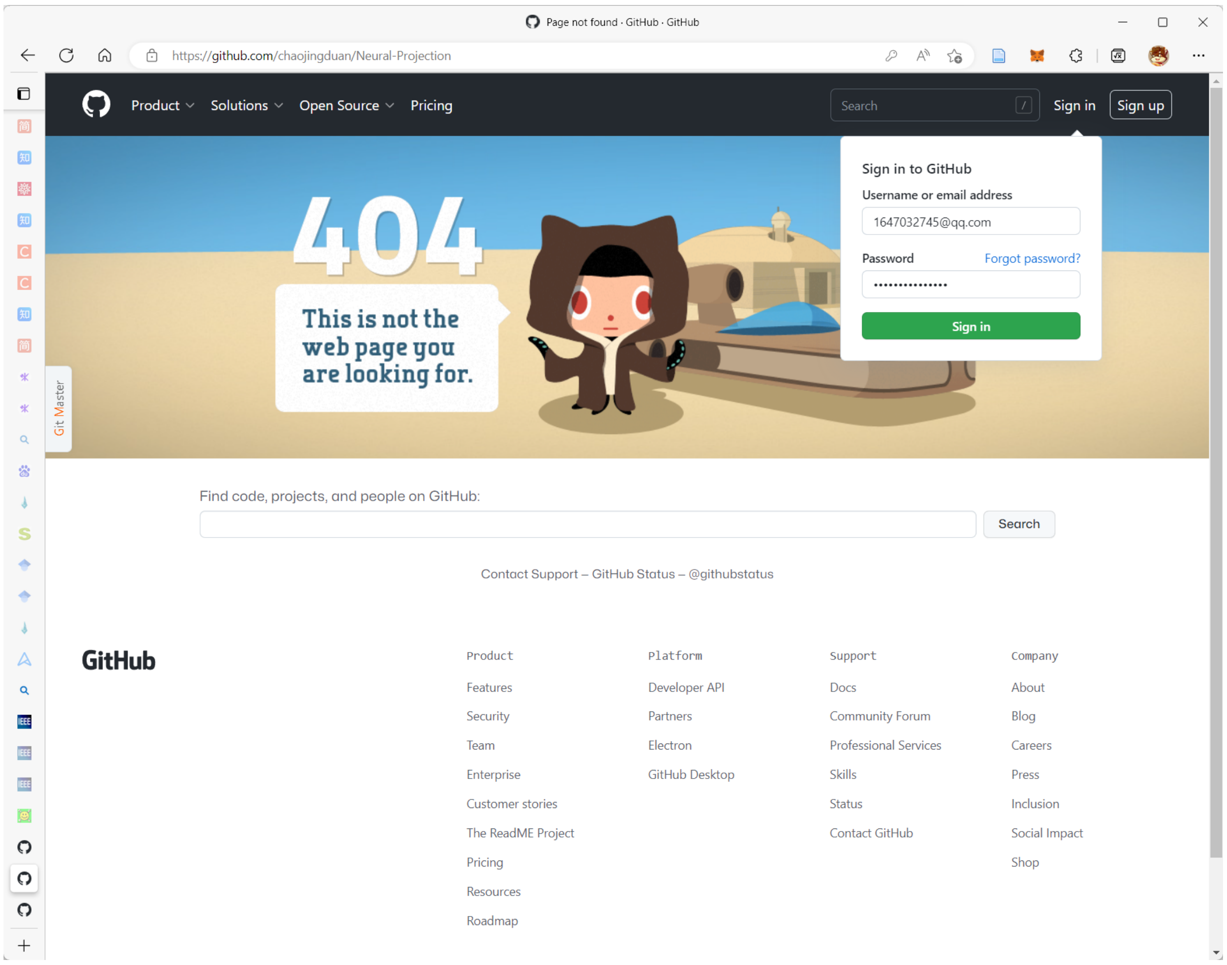

TotalDenoising/Train.py at master · phermosilla/TotalDenoising · GitHub

https://github.com/phermosilla/TotalDenoising/blob/master/Train.py

predPts 0/13

```python
    increment_epoch_step_op = tf.assign(epoch_step, epoch_step+1)

    #Create the network.
    mPointHierarchyIn = model.create_point_hierarchy_input(inPts, inBatchIds, inFeatures, 1, relRad=False)
    mConvBuilder = model.create_convolution_builder(relRad=False, usePDF=True)

    with tf.variable_scope('Denoiser_scope'):

        predDisp = model.create_network_parts(mPointHierarchyIn, mConvBuilder, inFeatures, 1,
            args.grow, isTraining, dropVal)  get displacement
        predPts = inPts+predDisp  InputPoint pos + displacement

        if args.eval:
            mConvBuilderGauss = model.create_convolution_builder(relRad=False, usePDF=False)
            lowFreqDisp = model.create_gaussian_conv(mPointHierarchyIn, predDisp, radius=0.035, relRad = False)
            predEvalDisp = predDisp-lowFreqDisp
            predPtsEval = inPts+predEvalDisp

            distancesGraph, _, _ = point_to_mesh_distance(predPtsEval,
                inVertexs, inFaces, inFaceIndexs, inVoxelIndexs, inAABBMin, inCellSizes)

    mPointHierarchyPred = model.create_point_hierarchy_output(predPts, inBatchIds, inFeatures, 1, relRad=False)
    mPointHierarchyClean = model.create_point_hierarchy_output(inPtsClean, inBatchIds, inFeatures, 1, relRad=False)

    #Create losses
    patchRadius = 0.05

    #Loss for clean data.
    if args.cleanTargets:
        neighCleanPts, neighFeatures, _, startIndexsClean, packedNeighsClean = model.create_neighborhood(
            mPointHierarchyClean, mPointHierarchyIn, patchRadius, relRad=False)

        knnIndexs = find_knn(neighCleanPts, predPts, startIndexsClean, packedNeighsClean, -1)
        knnIndexsReshaped = tf.reshape(knnIndexs, [-1])
        regCleanPoints = tf.gather(neighCleanPts, knnIndexsReshaped)

        knnRegressIndexs = find_knn(neighCleanPts, predPts, startIndexsClean, packedNeighsClean, 1)
        knnRegressIndexsReshaped = tf.reshape(knnRegressIndexs, [-1])
        regressCleanPoints = tf.gather(neighCleanPts, knnRegressIndexsReshaped)
                                        compute loss
        diffLoss = create_loss(regressCleanPoints, predPts, regCleanPoints, args.lossOrder, epoch_step, \
            args.numTrainingSteps, patchRadius, args.regTerm, args.regCleanLambda)
    #Loss for noisy data.
    else:
        neighPredPts, _, _, startIndexsPred, packedNeighsPred = model.create_neighborhood(mPointHierarchyPred,
            mPointHierarchyIn, patchRadius, relRad=False)
        knnIndexs = find_knn(neighPredPts, predPts, startIndexsPred, packedNeighsPred, -1)
        knnIndexsReshaped = tf.reshape(knnIndexs, [-1])
        regPredPoints = tf.gather(neighPredPts, knnIndexsReshaped)

        mPointHierarchyColor = mPointHierarchyIn
```

3DPCD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https://github.com/chaojingduan/Neural-Projection

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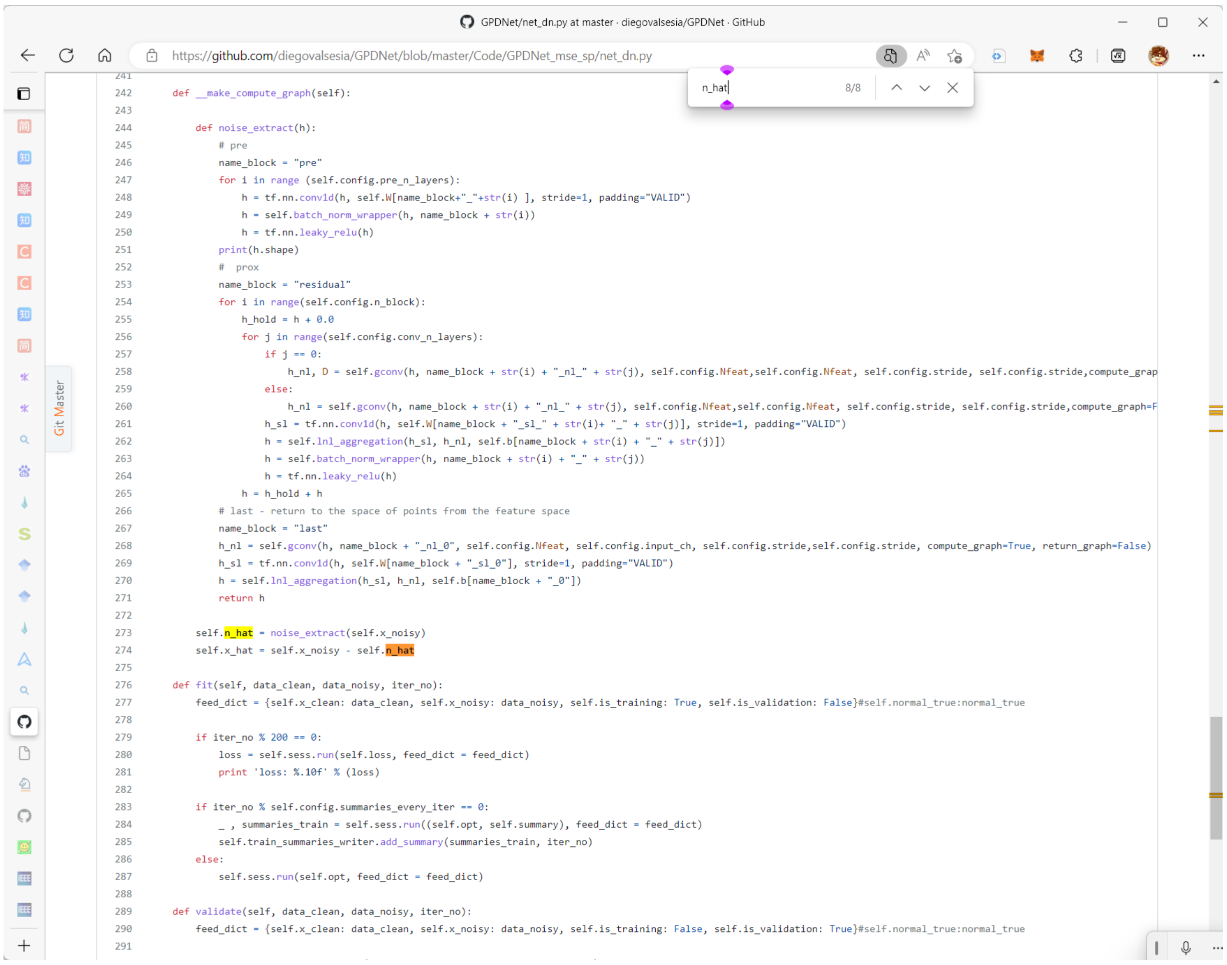
GPDNet



GPDNet/net_dn.py at master · diegovalsesia/GPDNet · GitHub

https://github.com/diegovalsesia/GPDNet/blob/master/Code/GPDNet_mse_sp/net_dn.py

```python
    def __make_compute_graph(self):

        def noise_extract(h):
            # pre
            name_block = "pre"
            for i in range (self.config.pre_n_layers):
                h = tf.nn.conv1d(h, self.W[name_block+"_"+str(i) ], stride=1, padding="VALID")
                h = self.batch_norm_wrapper(h, name_block + str(i))
                h = tf.nn.leaky_relu(h)
            print(h.shape)
            #  prox
            name_block = "residual"
            for i in range(self.config.n_block):
                h_hold = h + 0.0
                for j in range(self.config.conv_n_layers):
                    if j == 0:
                        h_nl, D = self.gconv(h, name_block + str(i) + "_nl_" + str(j), self.config.Nfeat,self.config.Nfeat, self.config.stride, self.config.stride,compute_grap
                    else:
                        h_nl = self.gconv(h, name_block + str(i) + "_nl_" + str(j), self.config.Nfeat,self.config.Nfeat, self.config.stride, self.config.stride,compute_graph=F
                    h_sl = tf.nn.conv1d(h, self.W[name_block + "_sl_" + str(i)+ "_" + str(j)], stride=1, padding="VALID")
                    h = self.lnl_aggregation(h_sl, h_nl, self.b[name_block + str(i) + "_" + str(j)])
                    h = self.batch_norm_wrapper(h, name_block + str(i) + "_" + str(j))
                    h = tf.nn.leaky_relu(h)
                h = h_hold + h
            # last - return to the space of points from the feature space
            name_block = "last"
            h_nl = self.gconv(h, name_block + "_nl_0", self.config.Nfeat, self.config.input_ch, self.config.stride,self.config.stride, compute_graph=True, return_graph=False)
            h_sl = tf.nn.conv1d(h, self.W[name_block + "_sl_0"], stride=1, padding="VALID")
            h = self.lnl_aggregation(h_sl, h_nl, self.b[name_block + "_0"])
            return h

        self.n_hat = noise_extract(self.x_noisy)
        self.x_hat = self.x_noisy - self.n_hat

    def fit(self, data_clean, data_noisy, iter_no):
        feed_dict = {self.x_clean: data_clean, self.x_noisy: data_noisy, self.is_training: True, self.is_validation: False}#self.normal_true:normal_true

        if iter_no % 200 == 0:
            loss = self.sess.run(self.loss, feed_dict = feed_dict)
            print 'loss: %.10f' % (loss)

        if iter_no % self.config.summaries_every_iter == 0:
            _ , summaries_train = self.sess.run((self.opt, self.summary), feed_dict = feed_dict)
            self.train_summaries_writer.add_summary(summaries_train, iter_no)
        else:
            self.sess.run(self.opt, feed_dict = feed_dict)

    def validate(self, data_clean, data_noisy, iter_no):
        feed_dict = {self.x_clean: data_clean, self.x_noisy: data_noisy, self.is_training: False, self.is_validation: True}#self.normal_true:normal_true

```