

sfno 修改

models/networks/sfnonet.py

class SpectralFilterLayer

由于encoder中输入维度和输出维度不一样，故增加一个参数if_encoder，对该类作是否属于encoder的分类，并在spectral conv中修改输入输出维度

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51 class SpectralFilterLayer(nn.Module):
52     def __init__(
53         self,
54         forward_transform,
55         inverse_transform,
56         embed_dim,
57         filter_type="linear",
58         operator_type="diagonal",
59         hidden_size_factor=1,
60         factorization=None,
61         rank=1.0,
62         separable=False,
63         complex_activation="real",
64         spectral_layers=1,
65         bias=False,
66         drop_rate=0.0,
67         gain=1.0,
68     ):
69         super(SpectralFilterLayer, self).__init__()
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86 elif filter_type == "linear" and factorization is None:
87     self.filter = SpectralConv(
88         forward_transform,
89         inverse_transform,
90         embed_dim,
91         embed_dim,
92         operator_type=operator_type,
93         separable=separable,
94         bias=bias,
95         gain=gain,
96     )
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98
99 elif filter_type == "linear" and factorization is not None:
100     self.filter = FactorizedSpectralConv(
101         forward_transform,
102         inverse_transform,
103         embed_dim,
104         embed_dim,
105         operator_type=operator_type,
106         rank=rank,
107         factorization=factorization,
108         separable=separable,
109         bias=bias,
110         gain=gain,
111     )
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class FourierNeuralOperatorBlock

修改原因和方式同上。

```
119 class FourierNeuralOperatorBlock(nn.Module):
120     def __init__(
121         self,
122         forward_transform,
123         inverse_transform,
124         embed_dim,
125         filter_type="linear",
126         operator_type="diagonal",
127         mlp_ratio=2.0,
128         mlp_drop_rate=0.0,
129         path_drop_rate=0.0,
130         act_layer=nn.GELU,
131         norm_layer=(nn.Identity, nn.Identity),
132         rank=1.0,
133         factorization=None,
134         separable=False,
135         inner_skip="linear",
136         outer_skip=None,
137         use_mlp=False,
138         comm_feature_inp_name=None,
139         comm_feature_hidden_name=None,
140         complex_activation="real",
141         spectral_layers=1,
142         bias=False,
143         final_activation=False,
144         checkpointing=0,
145     ):
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<pre> 166 if inner_skip == "linear": 167 self.inner_skip = nn.Conv2d(embed_dim, embed_dim, 1, 1, bias=False) 168 gain_factor /= 2.0 169 nn.init.normal_(self.inner_skip.weight, std=math.sqrt(gain_factor / embed_dim)) </pre>	<pre> 174 if inner_skip == "linear": 175 # jiaqilong modify 176 if if_encoder == 0: 177 self.inner_skip = nn.Conv2d(embed_dim, embed_dim, 1, 1, bias=False) 178 gain_factor /= 2.0 179 nn.init.normal_(self.inner_skip.weight, std=math.sqrt(gain_factor / embed_dim)) 180 else: 181 self.inner_skip = nn.Conv2d(embed_dim[0], embed_dim[1], 1, 1, bias=False) 182 gain_factor /= 2.0 183 nn.init.normal_(self.inner_skip.weight, std=math.sqrt(gain_factor / embed_dim)) </pre>
<pre> 179 self.filter = SpectralFilterLayer(180 forward_transform, 181 inverse_transform, 182 embed_dim, 183 filter_type, 184 operator_type, 185 hidden_size_factor=mlp_ratio, 186 factorization=factorization, 187 rank=rank, 188 separable=separable, 189 complex_activation=complex_activation, 190 spectral_layers=spectral_layers, 191 bias=bias, 192 drop_rate=drop_rate, 193 gain=gain_factor, 194) </pre>	<pre> 193 self.filter = SpectralFilterLayer(194 forward_transform, 195 inverse_transform, 196 embed_dim, 197 filter_type, 198 operator_type, 199 hidden_size_factor=mlp_ratio, 200 factorization=factorization, 201 rank=rank, 202 separable=separable, 203 complex_activation=complex_activation, 204 spectral_layers=spectral_layers, 205 bias=bias, 206 drop_rate=drop_rate, 207 gain=gain_factor, 208 if_encoder=if_encoder 209) </pre>
<pre> 206 if outer_skip == "linear": 207 self.outer_skip = nn.Conv2d(embed_dim, embed_dim, 1, 1, bias=False) 208 gain_factor /= 2.0 209 torch.nn.init.normal_(self.outer_skip.weight, std=math.sqrt(gain_factor / embed_dim)) </pre>	<pre> 221 if outer_skip == "linear": 222 # self.outer_skip = nn.Conv2d(embed_dim, embed_dim, 1, 1, bias=False) 223 if if_encoder == 0: 224 self.outer_skip = nn.Conv2d(embed_dim, embed_dim, 1, 1, bias=False) 225 gain_factor /= 2.0 226 torch.nn.init.normal_(self.outer_skip.weight, std=math.sqrt(gain_factor / embed_dim)) 227 else: 228 self.outer_skip = nn.Conv2d(embed_dim[0], embed_dim[1], 1, 1, bias=False) 229 gain_factor /= 2.0 230 torch.nn.init.normal_(self.outer_skip.weight, std=math.sqrt(gain_factor / embed_dim)) </pre>

230行 参数初始化，sqrt中的分母选择我并无依据，还需斧正。

<pre> 218 if use_mlp == True: 219 MLPH = DistributedMLP if (comm.get_size("matmul") > 1) else MLP 220 mlp_hidden_dim = int(embed_dim * mlp_ratio) 221 self.mlp = MLPH(222 in_features=embed_dim, 223 hidden_features=mlp_hidden_dim, 224 act_layer=act_layer, 225 drop_rate=mlp_drop_rate, 226 drop_type="features", 227 comm_inp_name=comm_feature_inp_name, 228 comm_hidden_name=comm_feature_hidden_name, 229 checkpointing=checkpointing, 230 gain=gain_factor, 231) </pre>	<pre> 239 if use_mlp == True: 240 MLPH = DistributedMLP if (comm.get_size("matmul") > 1) else MLP 241 if if_encoder == 0: 242 mlp_hidden_dim = int(embed_dim * mlp_ratio) 243 self.mlp = MLPH(244 in_features=embed_dim, 245 hidden_features=mlp_hidden_dim, 246 act_layer=act_layer, 247 drop_rate=mlp_drop_rate, 248 drop_type="features", 249 comm_inp_name=comm_feature_inp_name, 250 comm_hidden_name=comm_feature_hidden_name, 251 checkpointing=checkpointing, 252 gain=gain_factor, 253) 254 else: 255 mlp_hidden_dim = int(embed_dim[1] * mlp_ratio) 256 self.mlp = MLPH(257 in_features=embed_dim[1], 258 hidden_features=mlp_hidden_dim, 259 act_layer=act_layer, 260 drop_rate=mlp_drop_rate, 261 drop_type="features", 262 comm_inp_name=comm_feature_inp_name, 263 comm_hidden_name=comm_feature_hidden_name, 264 checkpointing=checkpointing, 265 gain=gain_factor, 266) 267) </pre>
--	---

718行起，到800行，class Encoder_sfno，为单个变量的encoder。

801行起，到890行，class EncoderWrapper_sfno，为整个encoder，包含

892行起，到文件末，class SphericalFourierNeuralOperatorNetSfnoEnc，为替换encoder后的模型。