tf.estimator.DNNLinearCombinedClassifier

Contents

Class **DNNLinearCombinedClassifier**

Inherits From: `Estimator`

Defined in `tensorflow/python/estimator/canned/dnn_linear_combined.py`.

An estimator for TensorFlow Linear and DNN joined classification models.

Note: This estimator is also known as wide-n-deep.

Example:

```
numeric_feature = numeric_column(...)
categorical_column_a = categorical_column_with_hash_bucket(...)
categorical_column_b = categorical_column_with_hash_bucket(...)

categorical_feature_a_x_categorical_feature_b = crossed_column(...)
categorical_feature_a_emb = embedding_column(
    categorical_column=categorical_feature_a, ...)
categorical_feature_b_emb = embedding_column(
    categorical_id_column=categorical_feature_b, ...)

estimator = DNNLinearCombinedClassifier(
    # wide settings
    linear_feature_columns=[categorical_feature_a_x_categorical_feature_b],
    linear_optimizer=tf.train.FtrlOptimizer(...),
    # deep settings
    dnn_feature_columns=[
        categorical_feature_a_emb, categorical_feature_b_emb,
        numeric_feature],
    dnn_hidden_units=[1000, 500, 100],
    dnn_optimizer=tf.train.ProximalAdagradOptimizer(...))

# To apply L1 and L2 regularization, you can set optimizers as follows:
tf.train.ProximalAdagradOptimizer(
    learning_rate=0.1,
    l1_regularization_strength=0.001,
    l2_regularization_strength=0.001)
# It is same for FtrlOptimizer.

# Input builders
def input_fn_train: # returns x, y
  pass
estimator.train(input_fn=input_fn_train, steps=100)

def input_fn_eval: # returns x, y
  pass
metrics = estimator.evaluate(input_fn=input_fn_eval, steps=10)
def input_fn_predict: # returns x, None
  pass
predictions = estimator.predict(input_fn=input_fn_predict)
```

Input of `train` and `evaluate` should have following features, otherwise there will be a `KeyError`:

- for each `column` in `dnn_feature_columns` + `linear_feature_columns`:
- if `column` is a `_CategoricalColumn`, a feature with `key=column.name` whose `value` is a `SparseTensor`.
- if `column` is a `_WeightedCategoricalColumn`, two features: the first with `key` the id column name, the second with `key` the weight column name. Both features' `value` must be a `SparseTensor`.
- if `column` is a `_DenseColumn`, a feature with `key=column.name` whose `value` is a `Tensor`.

Loss is calculated by using softmax cross entropy.

Properties

config

model_dir

model_fn

Returns the model_fn which is bound to self.params.

Returns:

The model_fn with following signature: `def model_fn(features, labels, mode, config)`

params

Methods

__init__

```
__init__(
    model_dir=None,
    linear_feature_columns=None,
    linear_optimizer='Ftrl',
    dnn_feature_columns=None,
    dnn_optimizer='Adagrad',
    dnn_hidden_units=None,
    dnn_activation_fn=tf.nn.relu,
    dnn_dropout=None,
    n_classes=2,
    weight_column=None,
    label_vocabulary=None,
    input_layer_partitioner=None,
    config=None
)
```

Initializes a DNNLinearCombinedClassifier instance.

Args:

- `model_dir` : Directory to save model parameters, graph and etc. This can also be used to load checkpoints from the directory into a estimator to continue training a previously saved model.
- `linear_feature_columns` : An iterable containing all the feature columns used by linear part of the model. All items in the set must be instances of classes derived from `FeatureColumn` .
- `linear_optimizer` : An instance of `tf.Optimizer` used to apply gradients to the linear part of the model. Defaults to FTRL optimizer.
- `dnn_feature_columns` : An iterable containing all the feature columns used by deep part of the model. All items in the set must be instances of classes derived from `FeatureColumn` .
- `dnn_optimizer` : An instance of `tf.Optimizer` used to apply gradients to the deep part of the model. Defaults to Adagrad optimizer.
- `dnn_hidden_units` : List of hidden units per layer. All layers are fully connected.
- `dnn_activation_fn` : Activation function applied to each layer. If None, will use `tf.nn.relu` .
- `dnn_dropout` : When not None, the probability we will drop out a given coordinate.
- `n_classes` : Number of label classes. Defaults to 2, namely binary classification. Must be > 1.
- `weight_column` : A string or a `_NumericColumn` created by `tf.feature_column.numeric_column` defining feature column representing weights. It is used to down weight or boost examples during training. It will be multiplied by the loss of the example. If it is a string, it is used as a key to fetch weight tensor from the `features` . If it is a `_NumericColumn` , raw tensor is fetched by key `weight_column.key` , then weight_column.normalizer_fn is applied on it to get weight tensor.
- `label_vocabulary` : A list of strings represents possible label values. If given, labels must be string type and have any value in `label_vocabulary` . If it is not given, that means labels are already encoded as integer or float within [0, 1] for `n_classes=2` and encoded as integer values in {0, 1,..., n_classes-1} for `n_classes` >2 . Also there will be errors

if vocabulary is not provided and labels are string.

- `input_layer_partitioner`: Partitioner for input layer. Defaults to `min_max_variable_partitioner` with `min_slice_size` 64 << 20.
- `config`: RunConfig object to configure the runtime settings.

Raises:

- `ValueError`: If both linear_feature_columns and dnn_features_columns are empty at the same time.

`evaluate`

```
evaluate(
    input_fn,
    steps=None,
    hooks=None,
    checkpoint_path=None,
    name=None
)
```

Evaluates the model given evaluation data input_fn.

For each step, calls `input_fn`, which returns one batch of data. Evaluates until: - `steps` batches are processed, or - `input_fn` raises an end-of-input exception (`OutOfRangeError` or `StopIteration`).

Args:

- `input_fn`: Input function returning a tuple of: features - Dictionary of string feature name to `Tensor` or `SparseTensor`. labels - `Tensor` or dictionary of `Tensor` with labels.
- `steps`: Number of steps for which to evaluate model. If `None`, evaluates until `input_fn` raises an end-of-input exception.
- `hooks`: List of `SessionRunHook` subclass instances. Used for callbacks inside the evaluation call.
- `checkpoint_path`: Path of a specific checkpoint to evaluate. If `None`, the latest checkpoint in `model_dir` is used.
- `name`: Name of the evaluation if user needs to run multiple evaluations on different data sets, such as on training data vs test data. Metrics for different evaluations are saved in separate folders, and appear separately in tensorboard.

Returns:

A dict containing the evaluation metrics specified in `model_fn` keyed by name, as well as an entry `global_step` which contains the value of the global step for which this evaluation was performed.

Raises:

- `ValueError`: If `steps <= 0`.
- `ValueError`: If no model has been trained, namely `model_dir`, or the given `checkpoint_path` is empty.

`export_savedmodel`

```
export_savedmodel(
    export_dir_base,
    serving_input_receiver_fn,
    assets_extra=None,
    as_text=False,
    checkpoint_path=None
)
```

Exports inference graph as a SavedModel into given dir.

This method builds a new graph by first calling the serving_input_receiver_fn to obtain feature `Tensor`s, and then calling this `Estimator`'s model_fn to generate the model graph based on those features. It restores the given checkpoint (or, lacking that, the most recent checkpoint) into this graph in a fresh session. Finally it creates a timestamped export directory below the given export_dir_base, and writes a `SavedModel` into it containing a single `MetaGraphDef` saved from this session.

The exported `MetaGraphDef` will provide one `SignatureDef` for each element of the export_outputs dict returned from the model_fn, named using the same keys. One of these keys is always signature_constants.DEFAULT_SERVING_SIGNATURE_DEF_KEY, indicating which signature will be served when a serving request does not specify one. For each signature, the outputs are provided by the corresponding `ExportOutput`s, and the inputs are always the input receivers provided by the serving_input_receiver_fn.

Extra assets may be written into the SavedModel via the extra_assets argument. This should be a dict, where each key gives a destination path (including the filename) relative to the assets.extra directory. The corresponding value gives the full path of the source file to be copied. For example, the simple case of copying a single file without renaming it is specified as `{'my_asset_file.txt': '/path/to/my_asset_file.txt'}`.

Args:

- `export_dir_base`: A string containing a directory in which to create timestamped subdirectories containing exported SavedModels.
- `serving_input_receiver_fn`: A function that takes no argument and returns a `ServingInputReceiver`.
- `assets_extra`: A dict specifying how to populate the assets.extra directory within the exported SavedModel, or `None` if no extra assets are needed.
- `as_text`: whether to write the SavedModel proto in text format.
- `checkpoint_path`: The checkpoint path to export. If `None` (the default), the most recent checkpoint found within the model directory is chosen.

Returns:

The string path to the exported directory.

Raises:

- `ValueError`: if no serving_input_receiver_fn is provided, no export_outputs are provided, or no checkpoint can be found.

get_variable_names

```
get_variable_names()
```

Returns list of all variable names in this model.

Returns:

List of names.

Raises:

- `ValueError`: If the Estimator has not produced a checkpoint yet.

`get_variable_value`

```
get_variable_value(name)
```

Returns value of the variable given by name.

Args:

- `name`: string or a list of string, name of the tensor.

Returns:

Numpy array - value of the tensor.

Raises:

- `ValueError`: If the Estimator has not produced a checkpoint yet.

`latest_checkpoint`

```
latest_checkpoint()
```

Finds the filename of latest saved checkpoint file in `model_dir`.

Returns:

The full path to the latest checkpoint or `None` if no checkpoint was found.

`predict`

```
predict(
    input_fn,
    predict_keys=None,
    hooks=None,
    checkpoint_path=None
)
```

Yields predictions for given features.

Args:

- `input_fn`: Input function returning features which is a dictionary of string feature name to `Tensor` or `SparseTensor`. If it returns a tuple, first item is extracted as features. Prediction continues until `input_fn` raises an end-of-input exception (`OutOfRangeError` or `StopIteration`).

- `predict_keys`: list of `str`, name of the keys to predict. It is used if the `EstimatorSpec.predictions` is a `dict`. If `predict_keys` is used then rest of the predictions will be filtered from the dictionary. If `None`, returns all.
- `hooks`: List of `SessionRunHook` subclass instances. Used for callbacks inside the prediction call.
- `checkpoint_path`: Path of a specific checkpoint to predict. If `None`, the latest checkpoint in `model_dir` is used.

Yields:

Evaluated values of `predictions` tensors.

Raises:

- `ValueError`: Could not find a trained model in model_dir.
- `ValueError`: if batch length of predictions are not same.
- `ValueError`: If there is a conflict between `predict_keys` and `predictions`. For example if `predict_keys` is not `None` but `EstimatorSpec.predictions` is not a `dict`.

`train`

```
train(
    input_fn,
    hooks=None,
    steps=None,
    max_steps=None,
    saving_listeners=None
)
```

Trains a model given training data input_fn.

Args:

- `input_fn`: Input function returning a tuple of: features - `Tensor` or dictionary of string feature name to `Tensor`. labels - `Tensor` or dictionary of `Tensor` with labels.
- `hooks`: List of `SessionRunHook` subclass instances. Used for callbacks inside the training loop.
- `steps`: Number of steps for which to train model. If `None`, train forever or train until input_fn generates the `OutOfRange` error or `StopIteration` exception. 'steps' works incrementally. If you call two times train(steps=10) then training occurs in total 20 steps. If `OutOfRange` or `StopIteration` occurs in the middle, training stops before 20 steps. If you don't want to have incremental behavior please set `max_steps` instead. If set, `max_steps` must be `None`.
- `max_steps`: Number of total steps for which to train model. If `None`, train forever or train until input_fn generates the `OutOfRange` error or `StopIteration` exception. If set, `steps` must be `None`. If `OutOfRange` or `StopIteration` occurs in the middle, training stops before `max_steps` steps. Two calls to `train(steps=100)` means 200 training iterations. On the other hand, two calls to `train(max_steps=100)` means that the second call will not do any iteration since first call did all 100 steps.
- `saving_listeners`: list of `CheckpointSaverListener` objects. Used for callbacks that run immediately before or after checkpoint savings.

Returns:

`self`, for chaining.

Raises:

- `ValueError`: If both `steps` and `max_steps` are not `None`.
- `ValueError`: If either `steps` or `max_steps` is <= 0.

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