Category embeddings

ADVANCED DEEP LEARNING WITH KERAS IN PYTHON

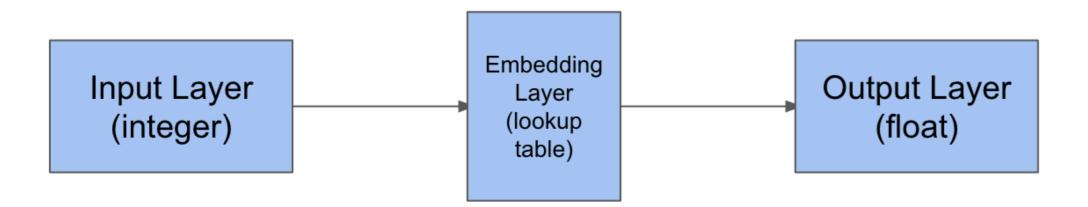


Zach Deane Mayer
Data Scientist



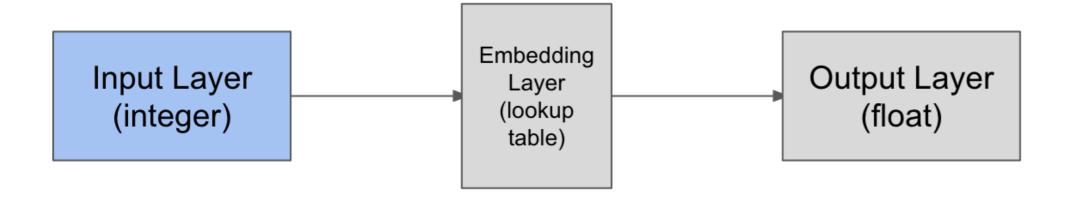
Category embeddings

- Input: integers
- Output: floats
- Note: Increased dimensionality: output layer flattens back to 2D

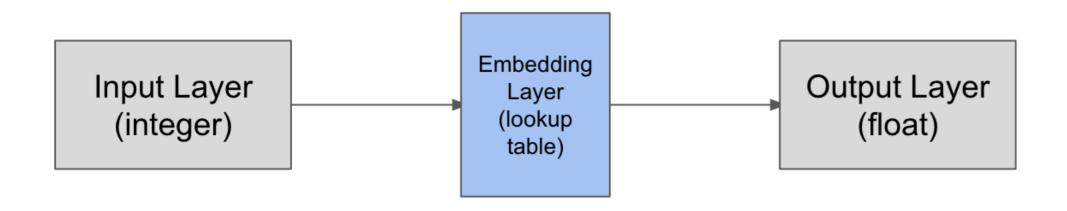


Inputs

```
input_tensor = Input(shape=(1,))
```

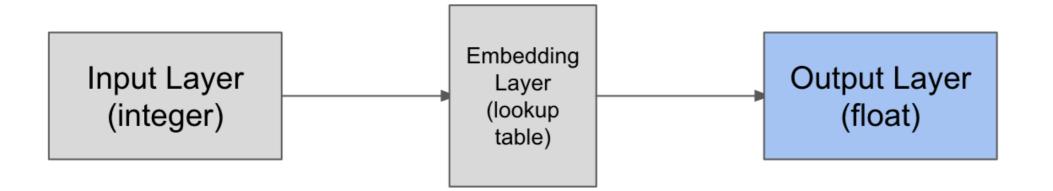


Embedding Layer

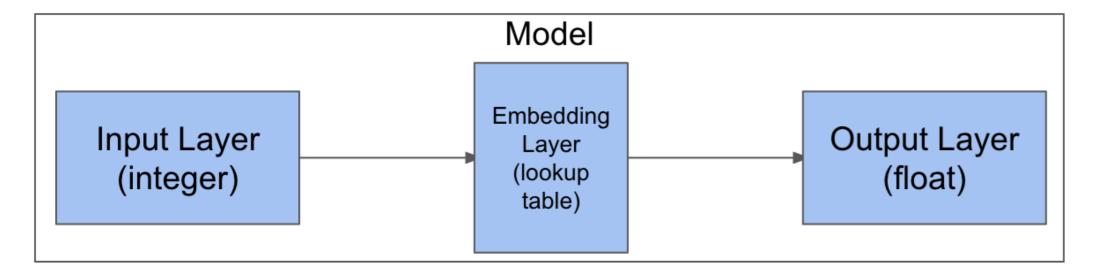


Flattening

```
from keras.layers import Flatten
flatten_tensor = Flatten()(embed_tensor)
```



Put it all together



Let's practice!

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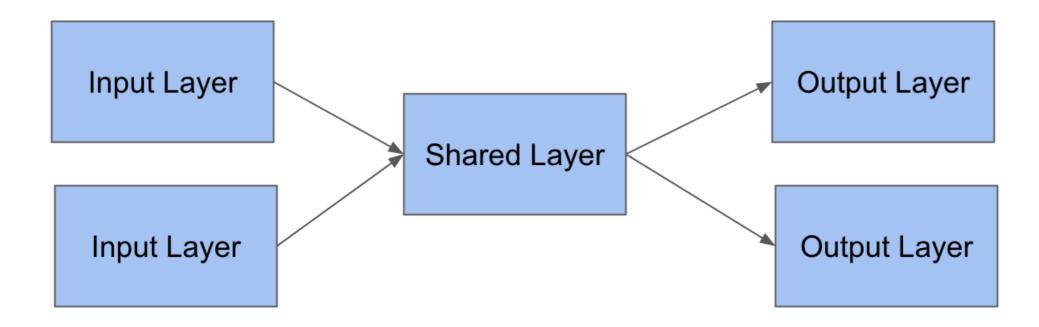
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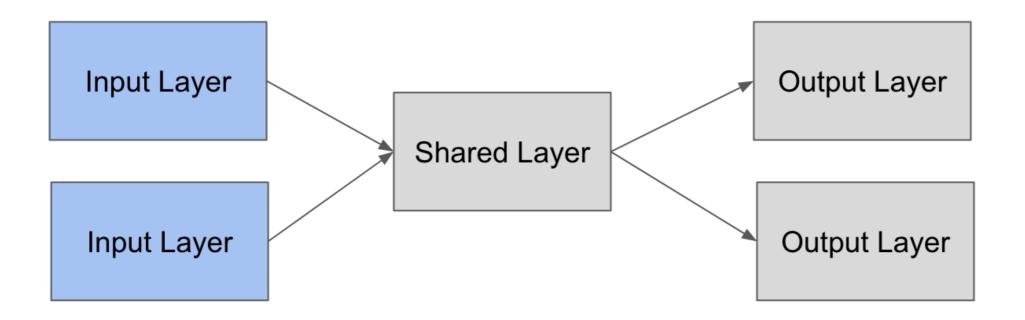
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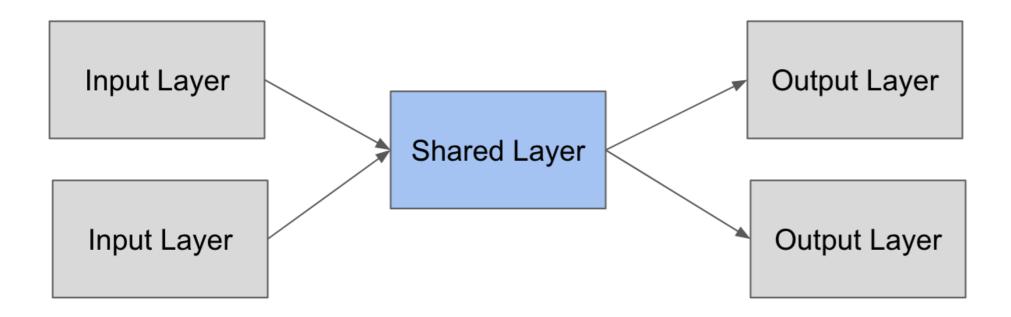
- Require the functional API
- Very flexible



```
input_tensor_1 = Input((1,))
input_tensor_2 = Input((1,))
```



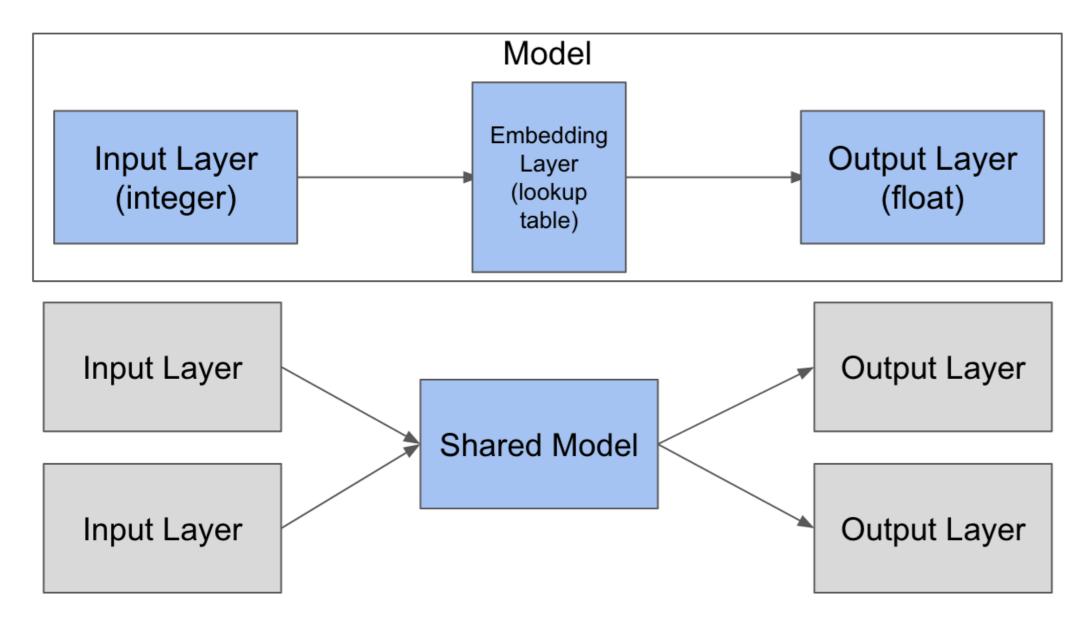
```
shared_layer = Dense(1)
output_tensor_1 = shared_layer(input_tensor_1)
output_tensor_2 = shared_layer(input_tensor_2)
```



Sharing multiple layers as a model

```
input_tensor_1 = Input((1,))
input_tensor_2 = Input((1,))
output_tensor_1 = model(input_tensor_1)
output_tensor_2 = model(input_tensor_2)
```

Sharing multiple layers as a model



Let's practice!

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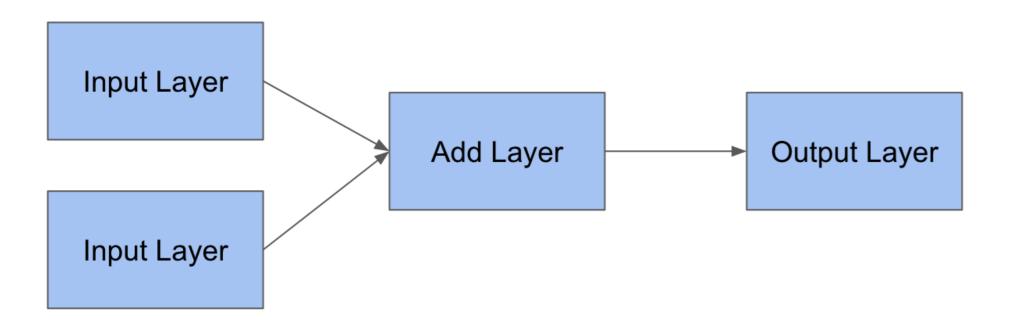


Zach Deane Mayer
Data Scientist

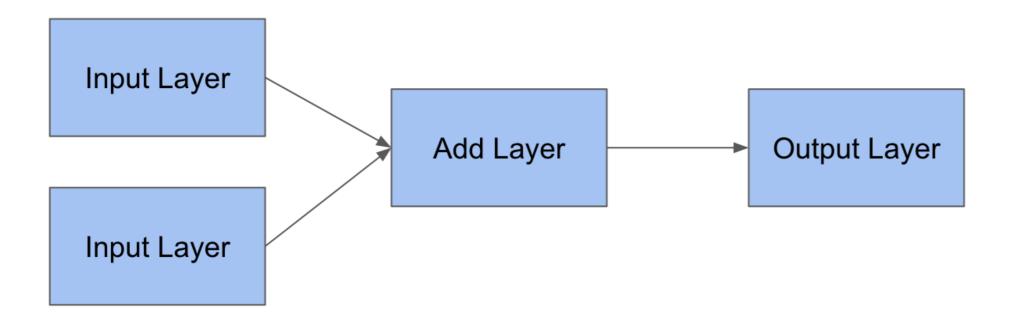


- Add
- Subtract
- Multiply
- Concatenate

```
from keras.layers import Input, Add
in_tensor_1 = Input((1,))
in_tensor_2 = Input((1,))
out_tensor = Add()([in_tensor_1, in_tensor_2])
```

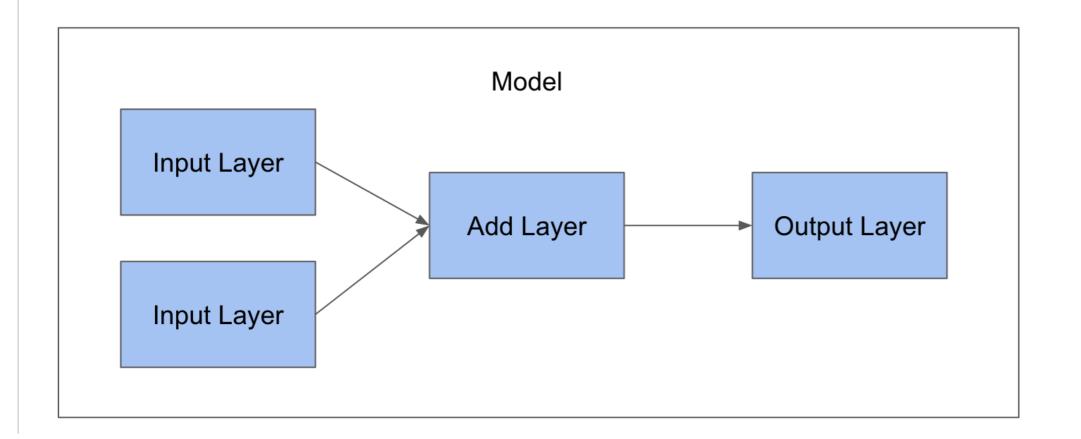


```
in_tensor_3 = Input((1,))
out_tensor = Add()([in_tensor_1, in_tensor_2, in_tensor_3])
```



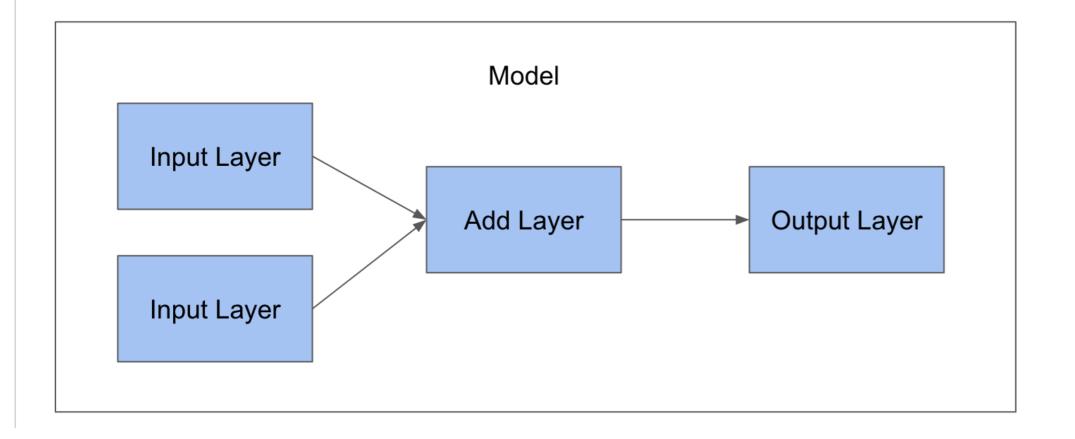
Create the model

```
from keras.models import Model
model = Model([in_tensor_1, in_tensor_2], out_tensor)
```



Compile the model

```
model.compile(optimizer='adam', loss='mean_absolute_error')
```



Let's practice!

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Fitting and Predicting with multiple inputs

ADVANCED DEEP LEARNING WITH KERAS IN PYTHON

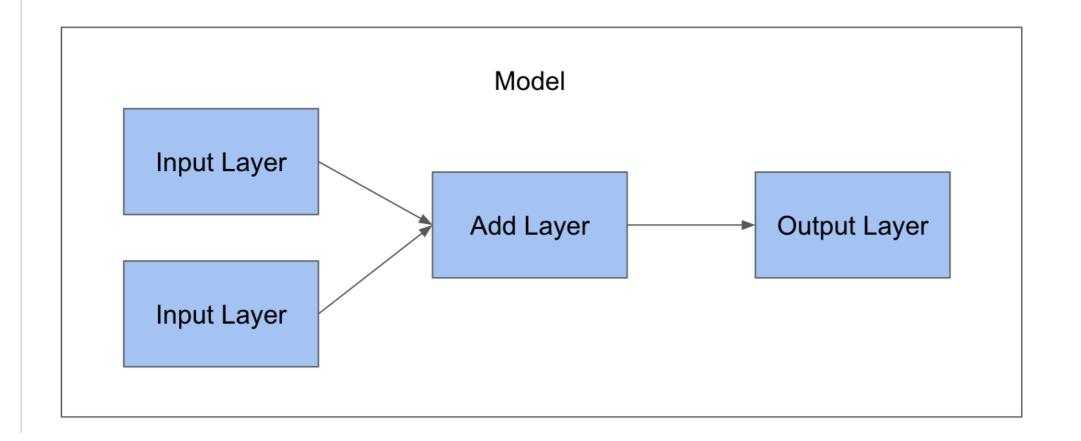


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Fit with multiple inputs

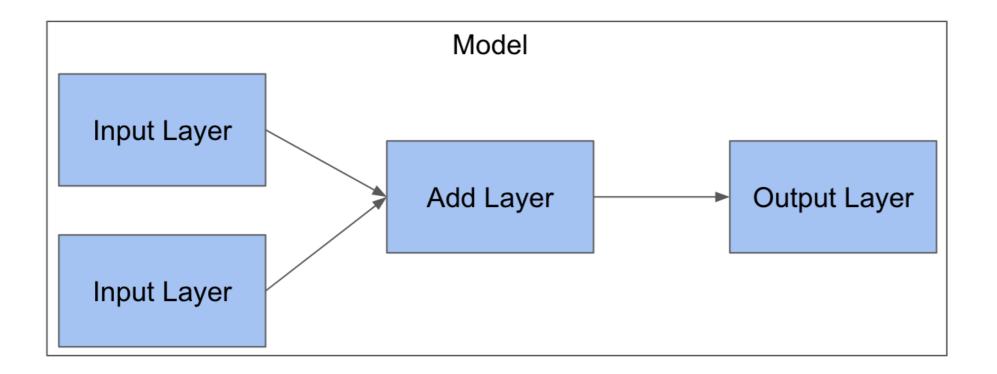
```
model.fit([data_1, data_2], target)
```



Predict with multiple inputs

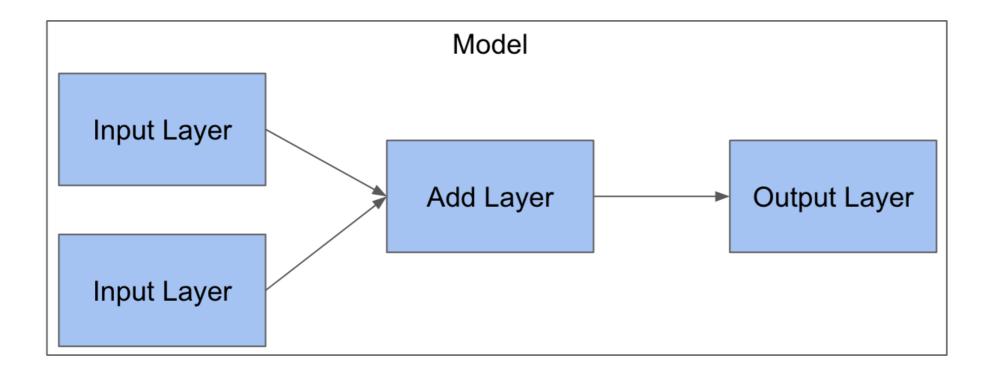
```
model.predict([np.array([[1]]), np.array([[2]])])
array([[3.]], dtype=float32)
```

```
model.predict([np.array([[42]]), np.array([[119]])])
array([[161.]], dtype=float32)
```



Evaluate with multiple inputs

```
model.evaluate([np.array([[-1]]), np.array([[-2]])], np.array([[-3]]
```



Let's practice!

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