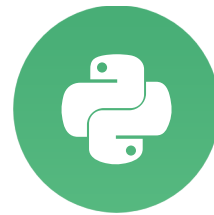


# Wrap-up

ADVANCED DEEP LEARNING WITH KERAS



Zach Deane-Mayer  
Data Scientist

# So far...

- Functional API
- Shared layers
- Categorical embeddings
- Multiple inputs
- Multiple outputs
- Regression / Classification in one model

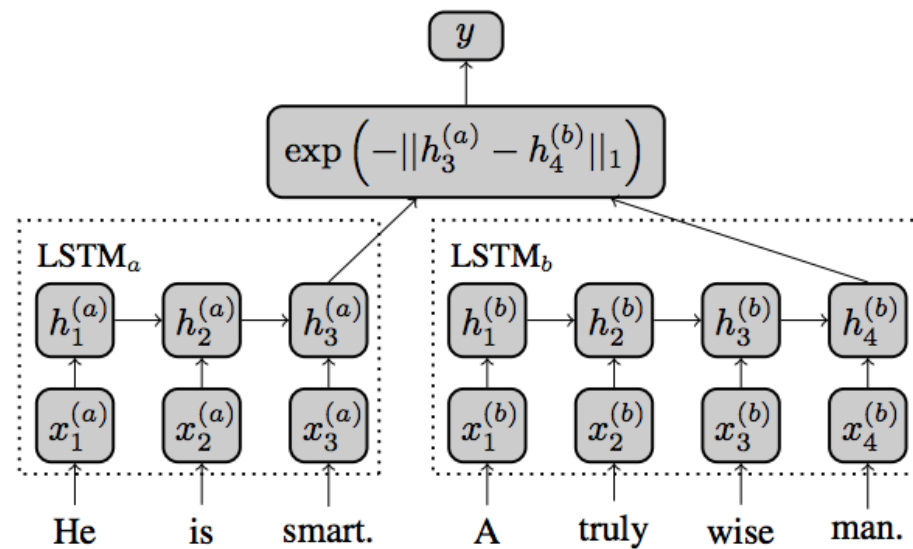
# Shared layers

Useful for making comparisons

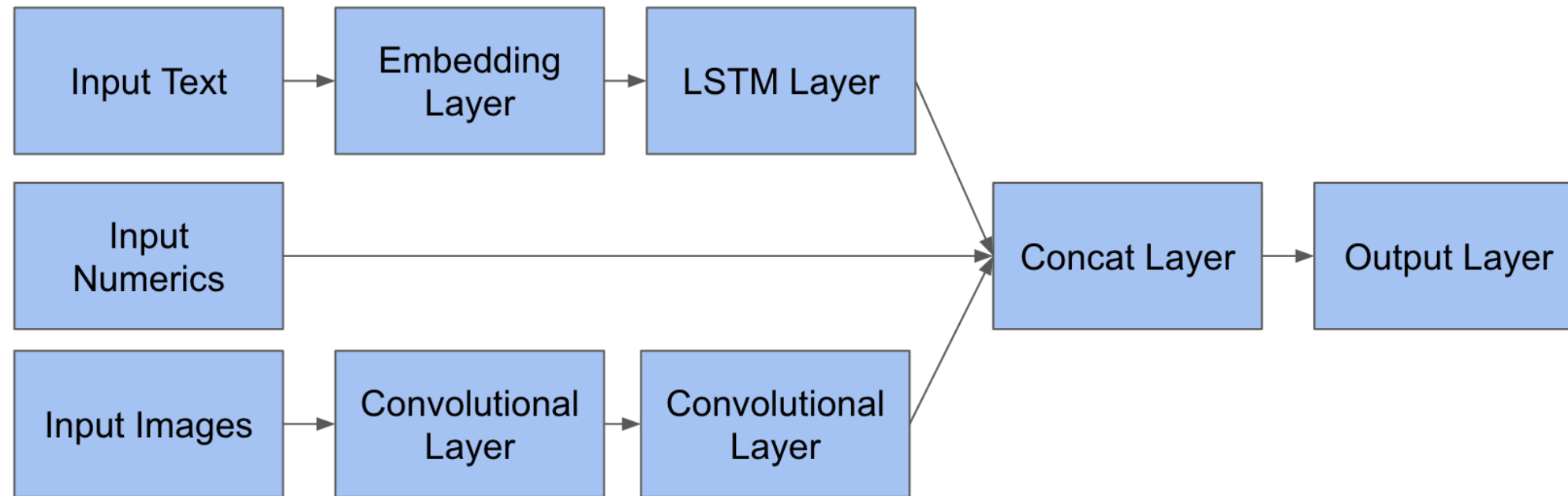
- Basketball teams
- Image similarity / retrieval
- Document similarity

Known in the academic literature as Siamese networks

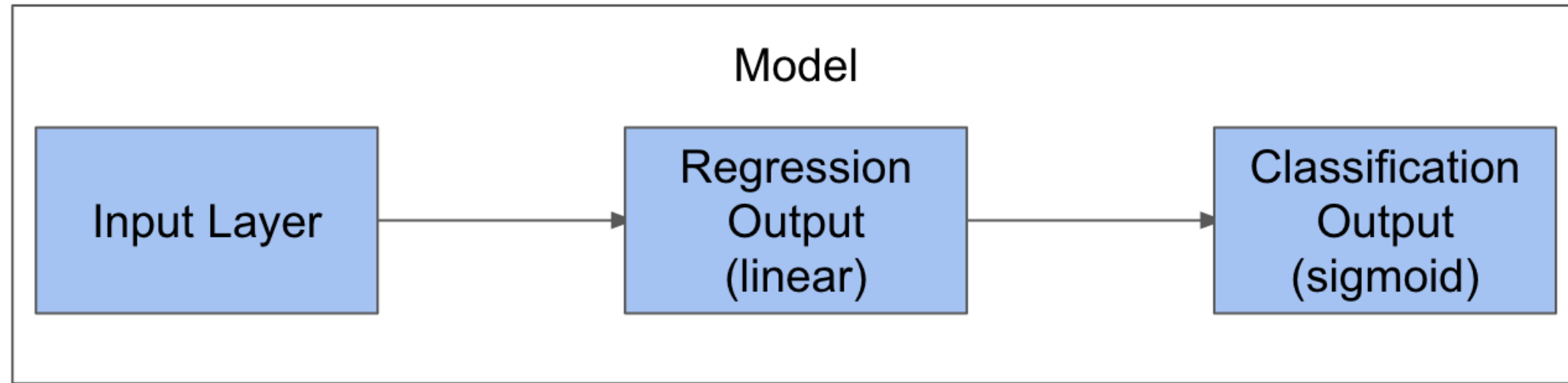
- [Link to blog post](#)
- [Link to academic paper](#)



# Multiple inputs



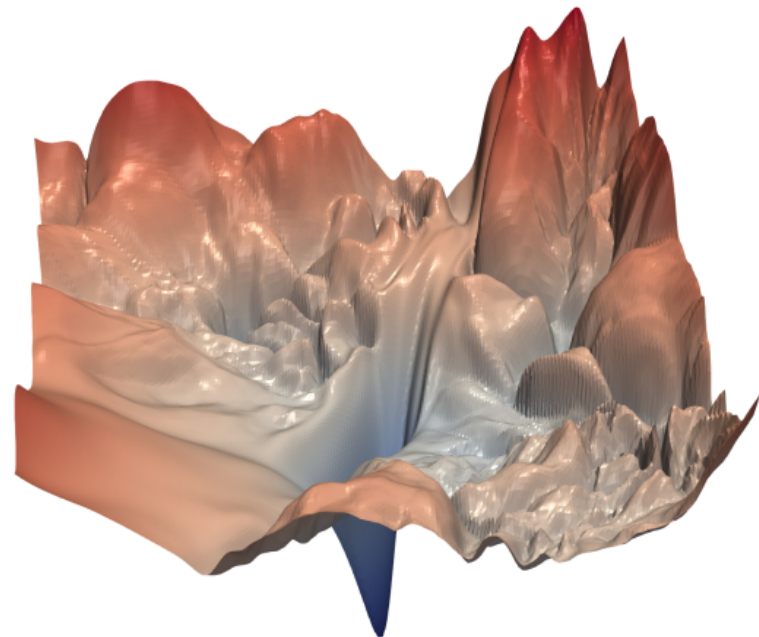
# Multiple outputs



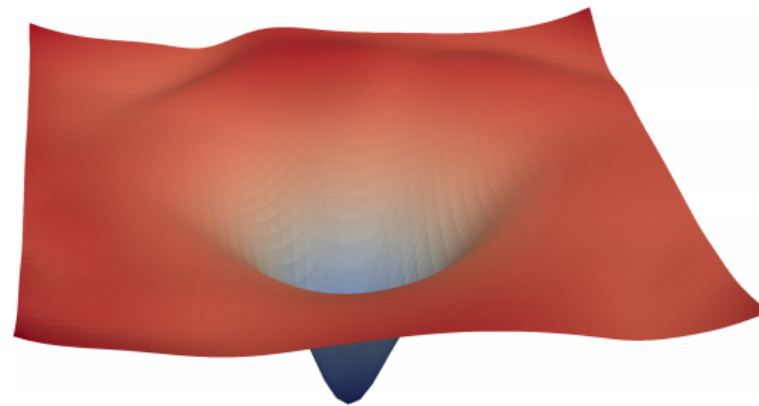
# Skip connections

```
input_tensor = Input((100,))  
hidden_tensor = Dense(256, activation='relu')(input_tensor)  
hidden_tensor = Dense(256, activation='relu')(hidden_tensor)  
hidden_tensor = Dense(256, activation='relu')(hidden_tensor)  
output_tensor = Concatenate()([input_tensor, hidden_tensor])  
output_tensor = Dense(256, activation='relu')(output_tensor)
```

## Visualizing the Loss Landscape of Neural Nets



(a) without skip connections



(b) with skip connections