Neural Networks or Traditional Models?

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DIFFERENCES

	TRADITIONAL MODELS	NEURAL NETWORKS
ARCHITECTURE	Algorithms that learn patterns from data using predefined features,	Interconnected nodes are arranged hierarchically in layers. Each layer is learning progressively more abstract features from the input data.
FEATURE ENGINEERING	Crucial. Domain knowledge is used to manually engineer relevant features from raw data.	They can learn features from raw data, reducing the need for feature engineering. However, preprocessing steps like normalization and dimensionality reduction are still important.
LEARNING APPROACH	Learn from data using algorithms to optimize predefined objective functions, such as minimizing mean squared error or maximizing likelihood.	Learn by adjusting the weights of connections between neurons through a process called backpropagation.
COMPLEXITY AND FLEXIBILITY	Less complex and more interpretable. They perform well on structured data with clear patterns but may struggle with complex and high-dimensional data.	More complex and harder to interpret. They are highly flexible and can learn complex patterns from raw data
SCALABILITY	Easier to train and deploy, particularly for small to medium-sized datasets.	Scale effectively with large datasets and benefit from advancements in parallel computing and specialized hardware like GPUs and TPUs.
TRAINING TIME	Faster to train because of their simplicity.	Require more computational power and time, especially when dealing with a vast amount of data or deeper architectures.
DATA REQUIREMENT	Can work well with smaller datasets	Require larger datasets to generalize well and avoid overfitting

LIMITATIONS

TRADITIONAL MODELS

- **Manual feature engineering**.
  This can be time-consuming and may not capture all relevant information in the data
- **Limited representation power**.
  They may struggle to capture intricate patterns in high-dimensional or unstructured data.
- **Difficulty with Nonlinear Relationships**.
  They may perform poorly when the underlying relationships in the data are nonlinear, requiring more complex models or feature transformations.

NEURAL NETWORKS

- **Computational Complexity**.
  Training large neural networks can be time-consuming and computationally expensive, making them less accessible.
- **Black Box Nature**.
  Understanding how these models arrive at their predictions can be challenging, limiting their interpretability.
- **Data Efficiency**.
  Require large amounts of labeled data to generalize well to unseen examples.

APPROACH