Predicting CS:GO Round Winners With Deep Learning

by Andrew Dettor

What is CS:GO?

- 5v5 tactical first-person shooter
- E-sport
- Terrorists vs. Counter Terrorists
- Match is split into rounds
  - Switch sides after 15 rounds
  - First team to win 16 rounds wins the match
- Dataset
  - [CS:GO Competitive Matchmaking Data](#) from Kaggle

Problem(s) at Hand

- Live betting services for e-sports
  - Bet on matches that are in progress
  - Predict the winner of the next round
- Improving your own play
  - What features lead to more round wins?
- Multi-channel variable-length multiple time-series classification problem with missing data and missing labels

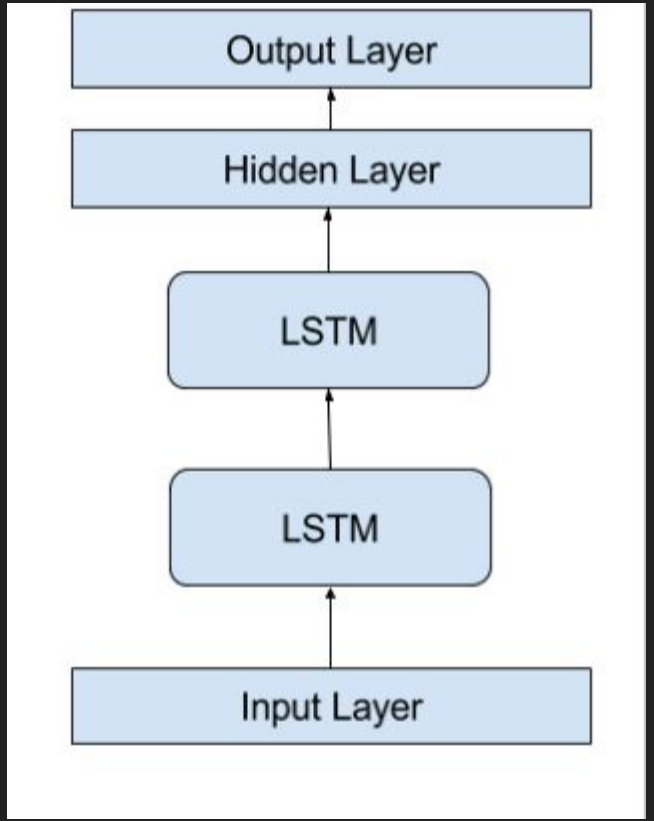
GG.BET

…What?

- Multi-channel
  - Many covariates with round winner (round length, each side’s total $, etc)
- Variable-length
  - Matches can be anywhere from 14 (forfeit) to 30 rounds
- Multiple
  - Many samples
- Time-series
  - Matches are separated into rounds
- Classification
  - Predict if T’s or CT’s win the next round
- Missing data and missing labels
  - Some rounds were missing entirely

Deep Learning Approach

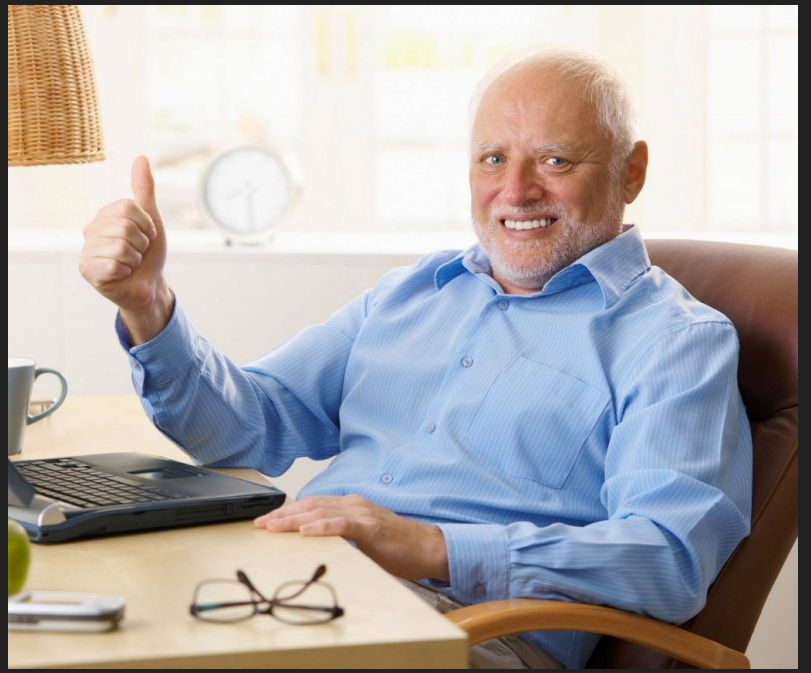
- LSTM
  - Data of shape: (matches x rounds x features)
  - 2 GRU layers w/ 16 hidden units
  - Dense layer w/ Sigmoid
- Validation Strategy
  - Feed rounds 1 to N-1 then predict winner of round N
  - Split matches into train/test/valid
- Missing data
  - Fill in each feature with its average for that round
- Missing labels
  - Mask missing labels in loss and accuracy calculations



Classification Results

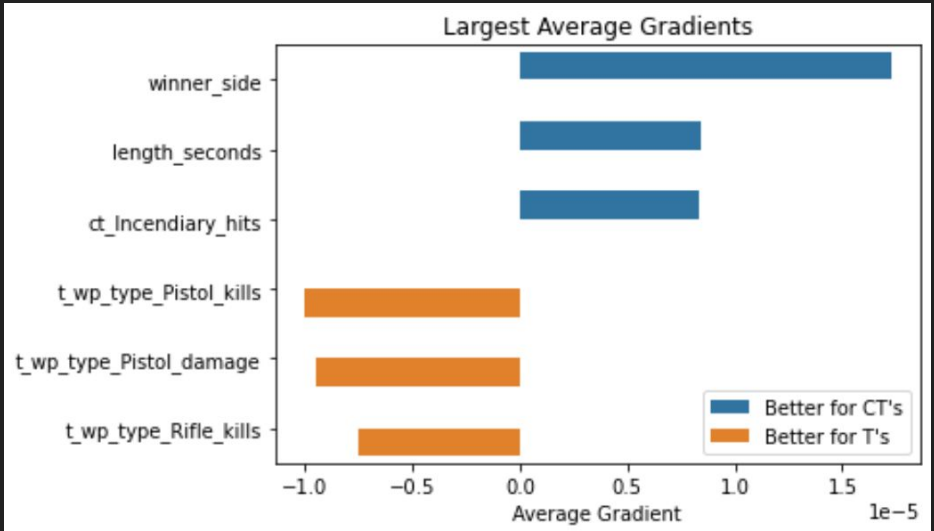
- 65% test set accuracy
  - Better than chance! (50%)
- 59% precision, 63% recall
  - Quite balanced classifier
- Confusion Matrix

	CT's Win Next Round	T's Win Next Round
Predicted CT's Win Next	27.54	18.94
Predicted T's Win Next	16.53	36.99

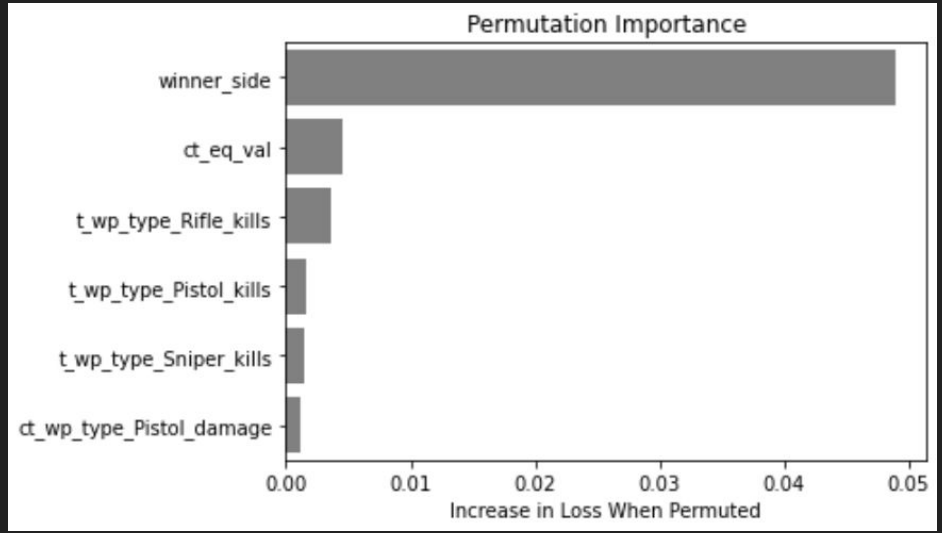


Feature Importance

Features' Average Gradients (model-based)



Permutation Importance (model-agnostic)



Conclusions

- Problem was difficult to translate to Deep Learning
- Model performance above random chance
  - Wouldn’t use it for betting though…
- Both feature importance methods align with common wisdom from the game
  - Correlation vs. Causation

Questions?