Dota 2 Heroes Recommendation System

Team Member: Zhe Chen, Kaisong Fan, Bohuai Jiang, Siyuan Sun

TEXAS A&M UNIVERSITY

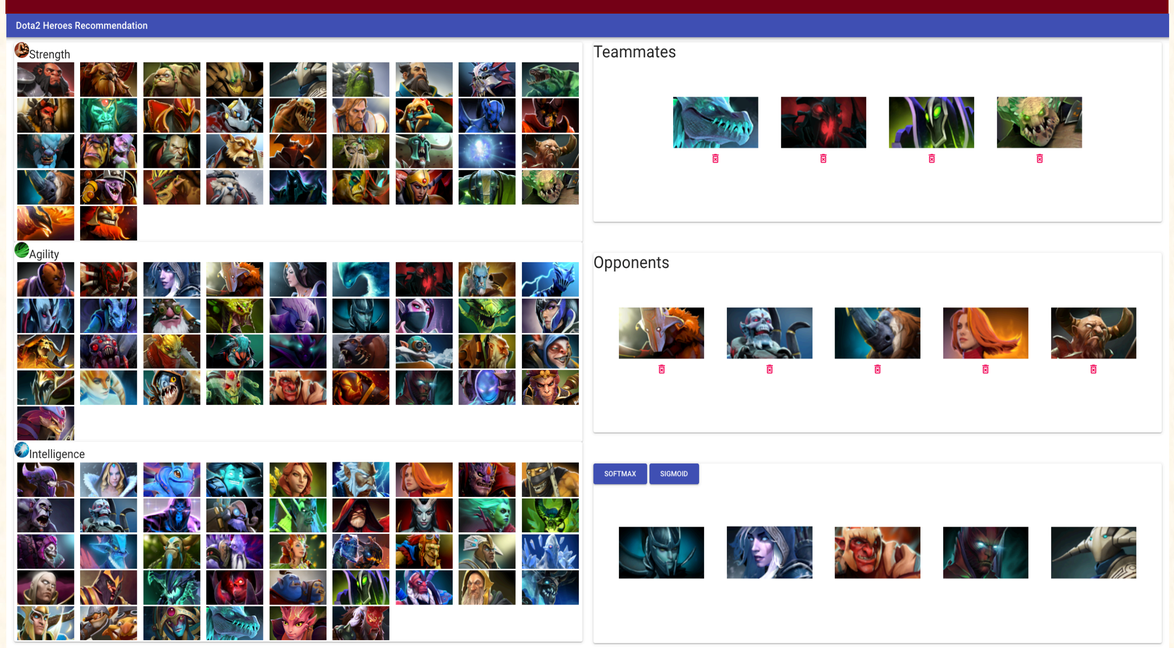
Introduction

DOTA2 is a multiplayer online battle arena video game developed and published by Valve Corporation, and the prize pool is more than 30 million dollars every year.

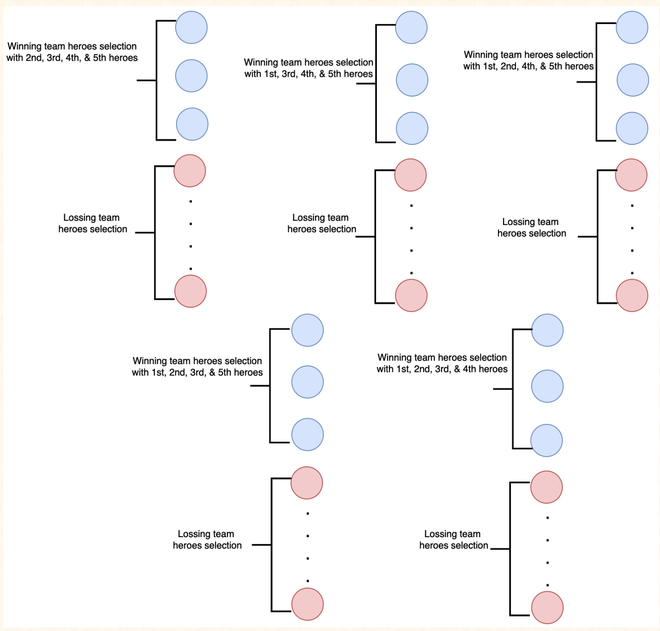
The purpose of this recommendation system is to recommend a hero that would help to win the match while 4 teammates and 5 opponents heroes are given by the users.

In this project, we constructed two traditional feedforward neural networks and both trained over 70,000 professional matches. A web user interface is also provided to let users setup their teammates and opponents heroes, and our model will recommend top 5 heroes that would increase users' winning chance.

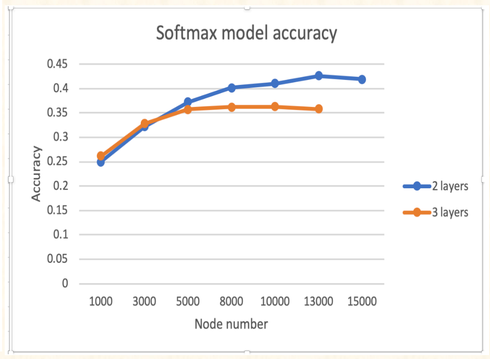
User Interface

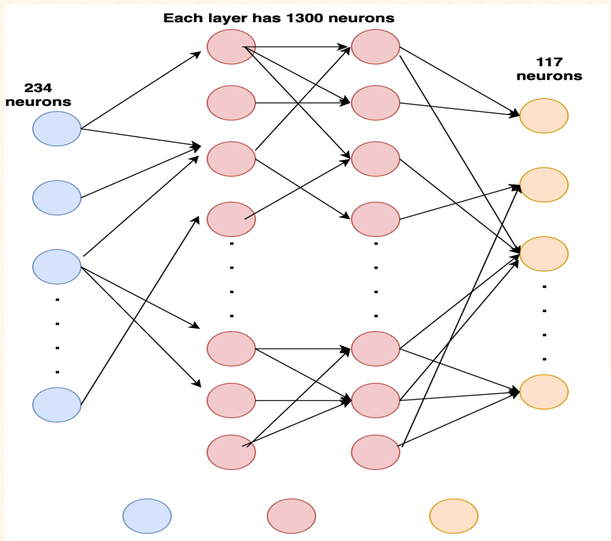


SoftMax Model



Data Source: OpenDota API
Training Size: over 250,000 matches
Model Description:
During the training of SoftMax model, the model used 'Adam' optimizer and loss function is "categorical_crossentropy". The last output layer used 'SoftMax' activation function so that each neuron has percentage



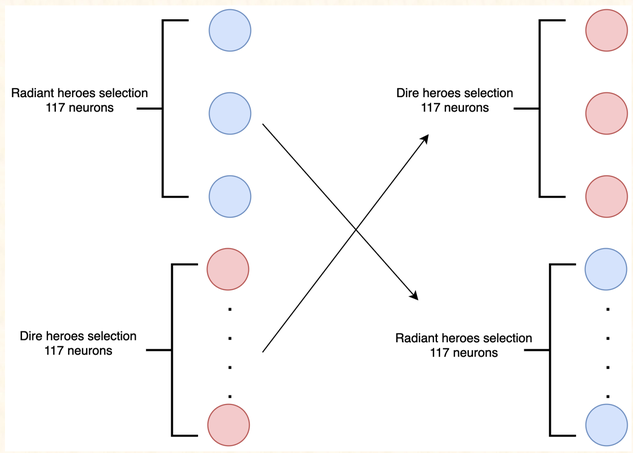


$$\begin{cases} count + 1, & actual\ hero \in Top5\ recommendation \\ count + 0, & Otherwise \end{cases}$$

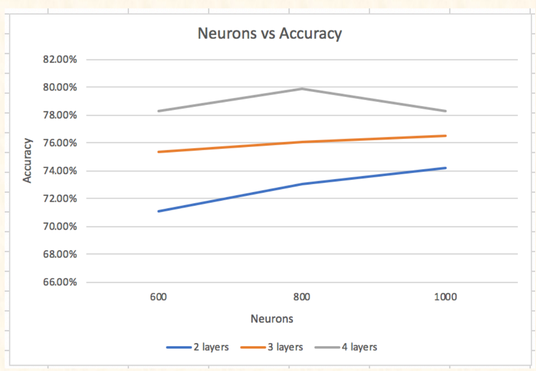
$$percentage = \frac{count}{total\ number\ of\ matches}$$

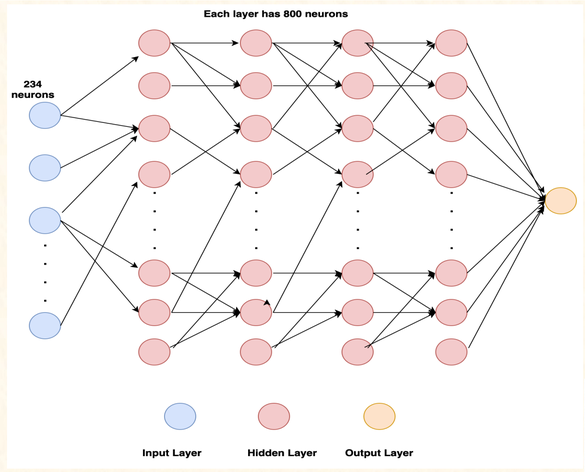
Sigmoid Model

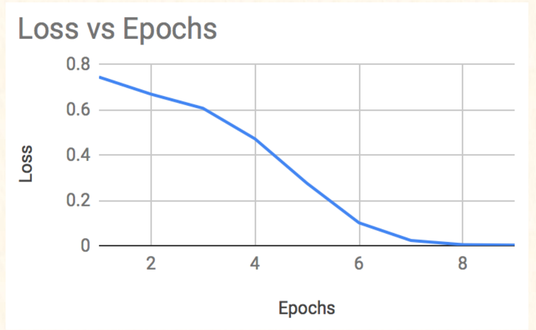
Data Source: Opendota API
Training Size: over 100,000 matches



Model Description:
During the training of Sigmoid model, the model used 'Adagrad' optimizer and loss function is "binary_crossentropy". The last output layer used 'Sigmoid' activation function and it outputs from a range 0-1



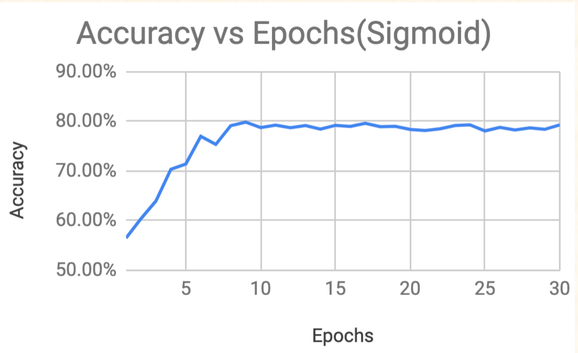


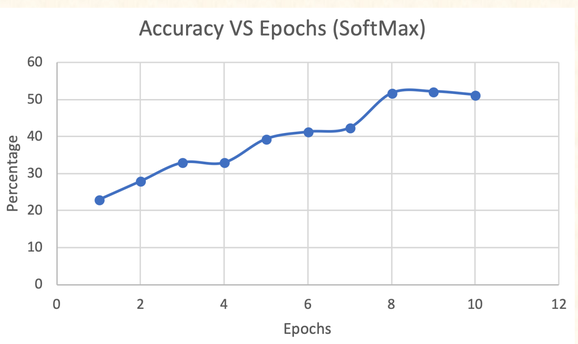


$$Winning\ chance = \frac{prob(Teammates\_Opponents) + (1 - prob(Opponents\_Teammates))}{2}$$

$$\begin{cases} 1, & winning\ chance > 0.5 \\ 0, & Otherwise \end{cases}$$

Results

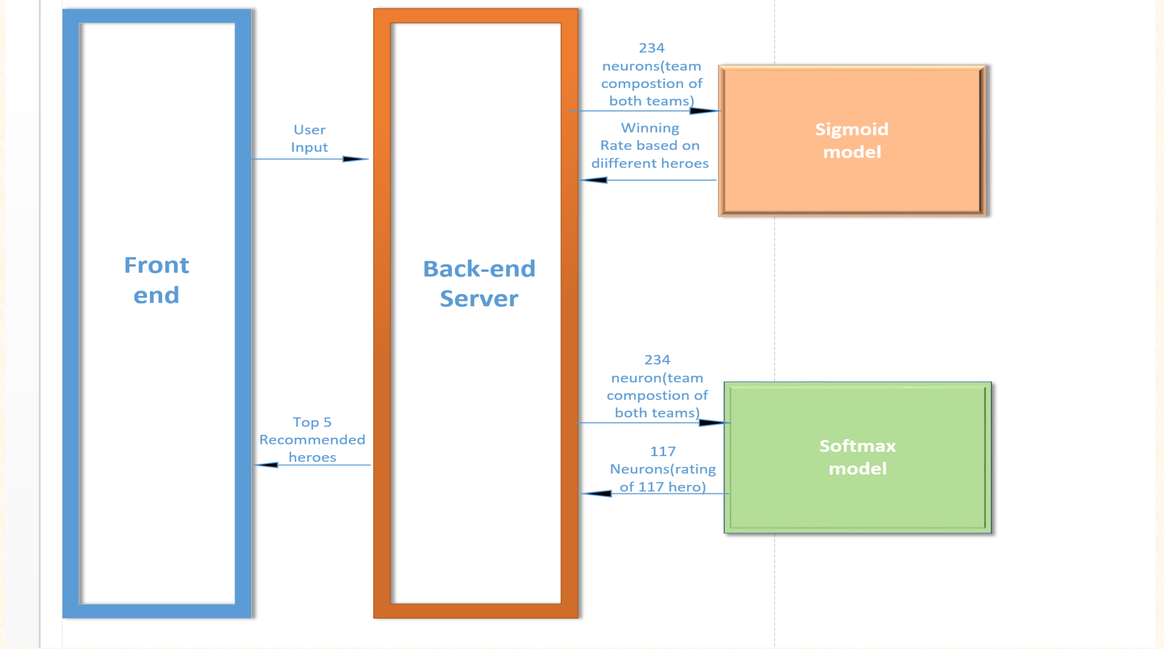




In our project, Sigmoid model predicts the teammates' winning chance and it has a 78% accuracy during evaluation. SoftMax model predicts the percentage for each hero and chooses the top 5 heroes. The percentage of actual hero shows up inside the Top 5 recommendation is 52.2% during evaluation.

Surprisingly, after manually evaluation, SoftMax model has a better prediction than Sigmoid model. During SoftMax model's evaluation, the formula only cares if the actual hero within the top 5 recommendation, that is not an ideal evaluation because heroes that have the similar type might also fit into the team. A professional player could be the best evaluation since the results can vary based on players preference.

Architecture



References

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Conley, Kevin, and Daniel Perry. "How Does He Saw Me? A Recommendation Engine for Picking Heroes in Dota 2 ."