An Analytical Approach to Optimizing The Utility of ESP Games

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Motivation

- ESP games annotate images on the web.
- Can we optimize the goodput of the game?
- Service provider can utilize our model to improve their system.

Idea

- Model the performance of the game and optimize it.
- A more generalized ESP game.
  - The number of players can be more than 2.
  - The consensus threshold can be any positive integer, but not larger than the number of players.
  - The stopping condition can be more than 1.

3 Collaborative Quantity

- Efficiency
  - the rate that labels are matched.
- Quality
  - the proportion of good labels among all matched labels.
- Utility
  - the throughput rate of good labels.
  - Utility = Efficiency $\times$ Quality

Assumption of Model

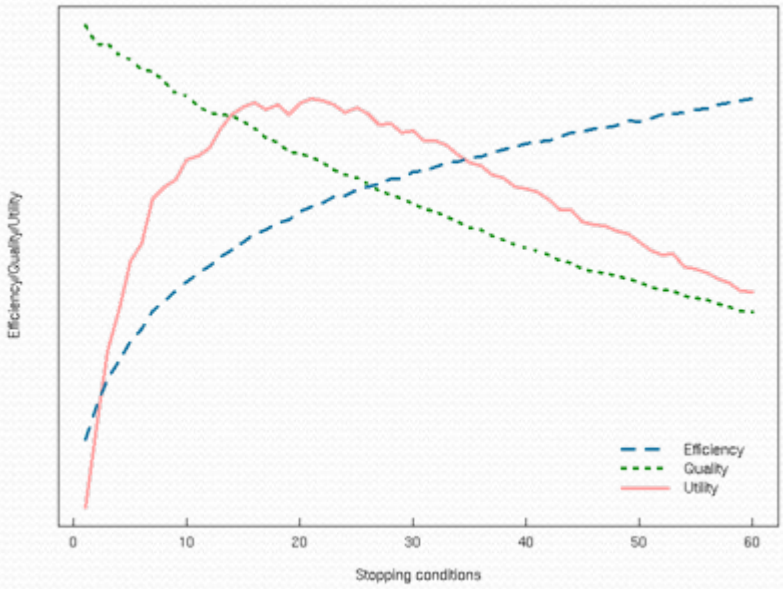
- Round-based play
  - Make only one guess in each round.
- Independent guess
  - Current guess is not affected by previous guesses.
- Good and bad words
  - The sizes of good and bad words are both limited.
  - Players will do their best to guess good words.
- Uniform guess
  - The guess is made uniformly.

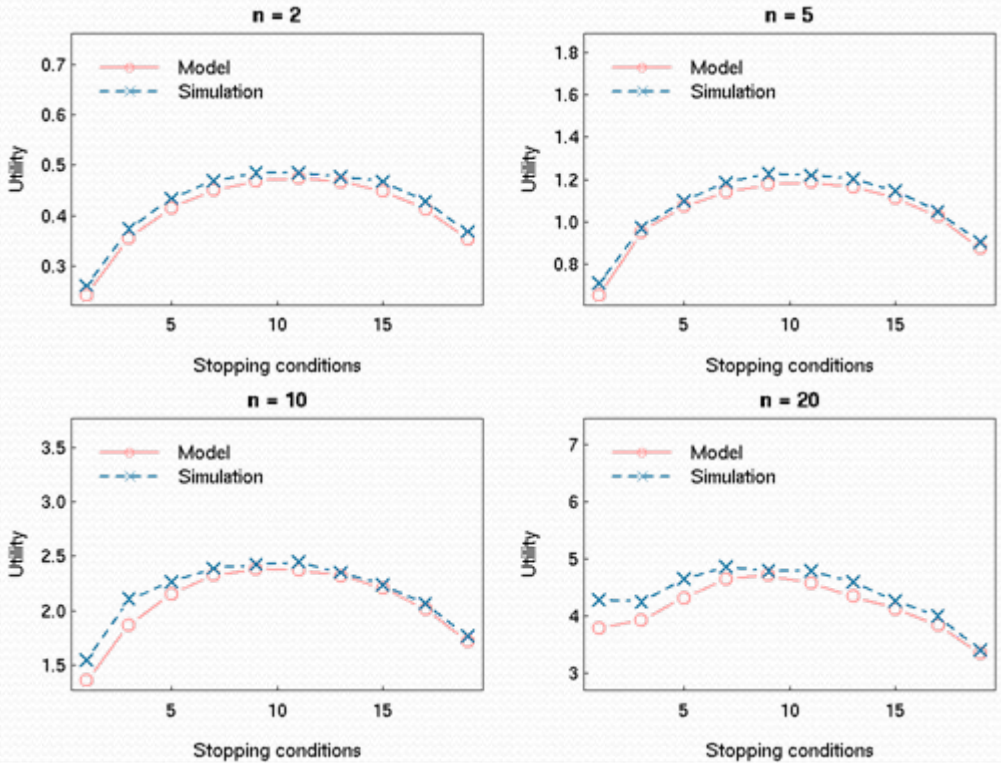
Parameters in the Model

- Number of players
  - denoted as n.
- Consensus threshold
  - denoted as m.
- Size of good vocabulary
  - denoted as v_{good}
- Probability of guessing good words
  - denoted as $prob_{good}$
- **Stopping condition** is our main variable.

Model Validation

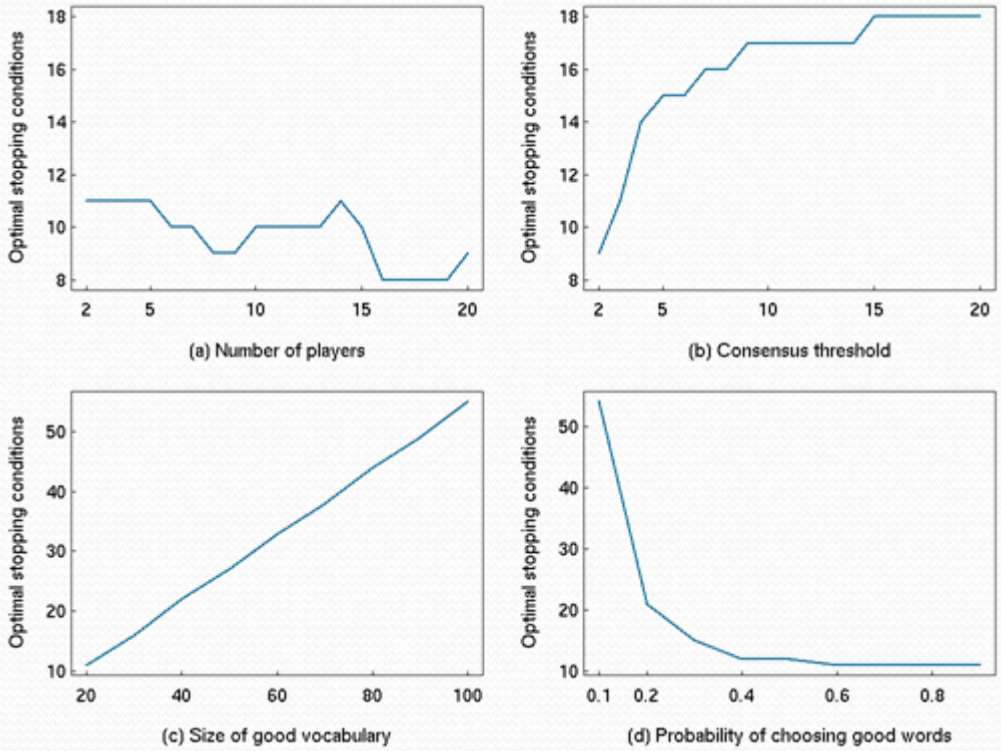
- Trade-off between efficiency & quality.
- Validate the model by simulations.





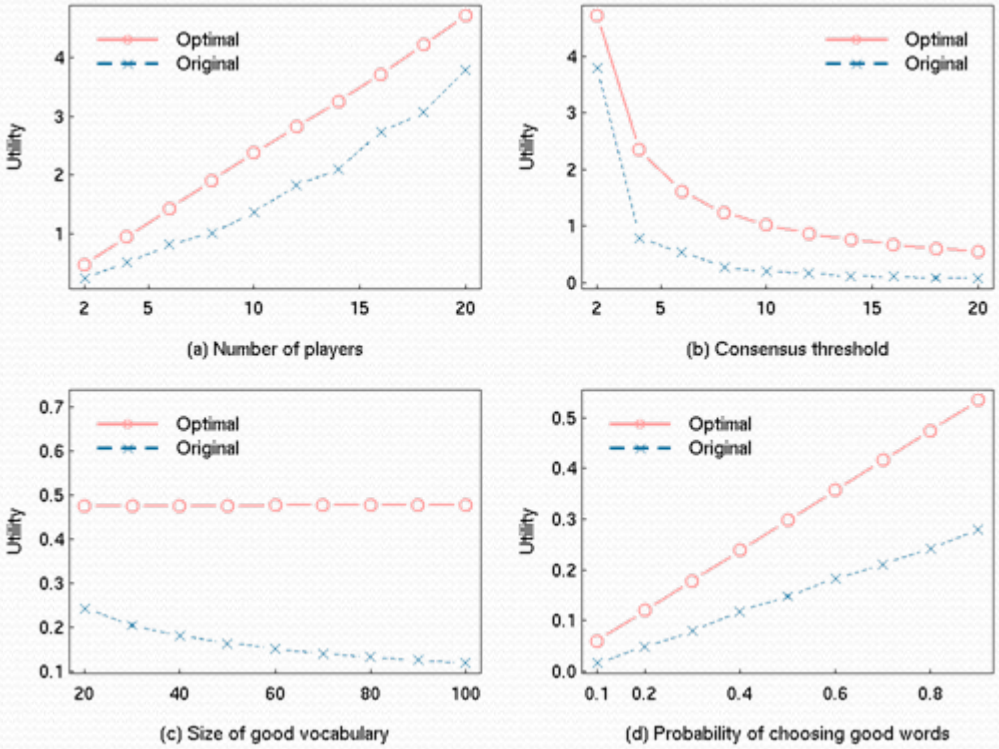
Optimal Stopping Conditions

- Optimal stopping condition changes under different parameter settings.



Benefit of Optimization

- We provide twice as much utility as a non-optimized game.



Contribution

- Model for generalized games.
- Propose an optimal termination condition to optimize the system.
- Game providers can utilize our model to maximize the outcome of games.

Thank You!