COLLEGE OF BUSINESS
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Research Horizons Day
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FIFA Ultimate Team Decision Model

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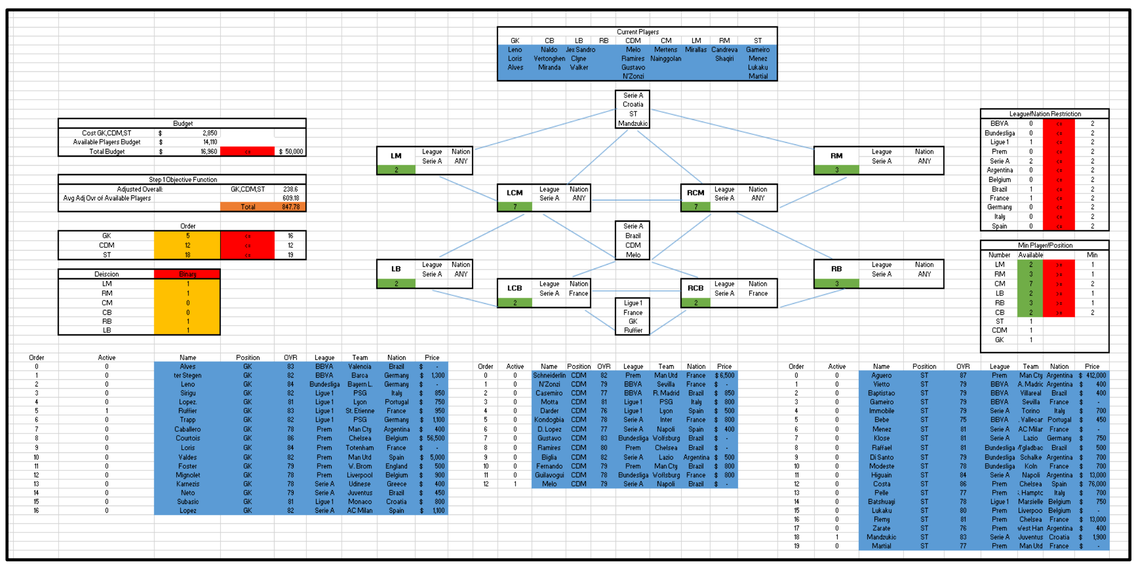
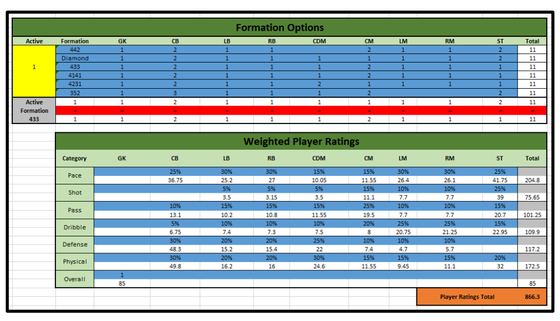
Overview

- FIFA Ultimate Team requires the gamer to operate their team as a business
- Decisions are made on formations, tactics, and buying/selling players
- Real money is used to purchase packs containing random players which are bought and sold with an in game currency on an open market
- A binary integer programming model was created within Excel's Solver software package and ran both Simplex LP and Evolutionary algorithms
- The objective of the model was to maximize weighted player ratings within a predetermined budget
- A comparative study was conducted to test the ability of the model vs real people
- Null and Alternative Hypotheses: H_0: $\mu_1 - \mu_2 = 0$
  H_1: $\mu_1 - \mu_2 \neq 0$
  $\propto = .05$



Above: Chemistry model; **Bottom left:** Team sheet from actual game; **Bottom right:** Formation model



Binary Integer Programming Model for the FUT Problem

Parameters:

F_{kj}: Number of athlete required for position j in formation k, as in the following table

	Position	1	2	3	4	5	6	7	8	9	
	Formation	GK	CB	LB	RB	CDM	CM	LM	RM	ST	Total
1	442	1	2	1	1		2	1	1	2	11
2	Diamond	1	2	1	1	1	1	1	1	2	11
3	433	1	2	1	1	1	2	1	1	1	11
4	4141	1	2	1	1	1	2	1	1	1	11
5	4231	1	2	1	1	2	1	1	1	1	11
6	352	1	3	1	1	1	2			2	11

A_j: Set of athletes who can play position j

P_i: Cost of hiring athlete i

B: Total budget

S_i: Total score of six attributes for athlete i, adjusted based on attribute weights assigned

Decision Variables:

X_i: = 1 if athlete i is selected; 0 otherwise

Y_k: = 1 if formation k is adopted; 0 otherwise

Objective function:

Max $\sum s_i x_i$ (Total score of the team)

Constraints:

$\sum P_i x_i \leq B$ (Budget Constraint)

$\sum y_k = 1$ (Only one formation is selected)

$\sum_{i \in A_j} x_i = \sum F_{kj}\, y_k \qquad j = 1, 2, \ldots, 9$

(Number of athletes selected for each position depends on formation selected)

x_i is binary

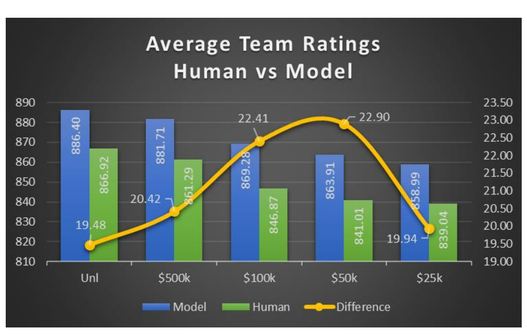
y_k is binary

Key Findings

- Model outperforms humans by 21 points on average for total player ratings (For each budget level, the difference is extremely significant for a pair-wise t test, P-value << .0001)
- Greatest difference at $50k where largest number of plausible options exists
- Standard deviation of the difference is largest in maximum and minimum resource categories
- Model outperformed human average within 10x less budget

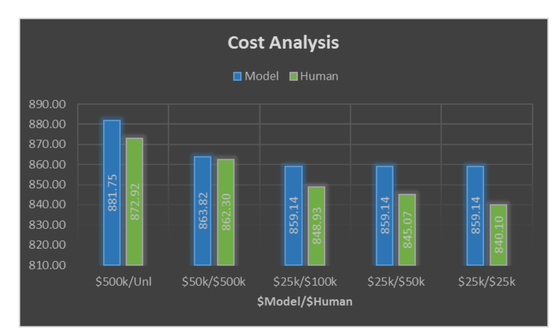
Impact

- Mathematical models, which solve the problem optimally, outperform human decision making
- Cost analysis for FUT model demonstrates the importance in real world applications
- Results demonstrate the importance for businesses with less resources to compete in their industry
- The models can be adapted to maximize available resources and/or minimize cost
- Management teams can be more confident in their decisions and spend more of their time and resources implementing the recommendations from the model



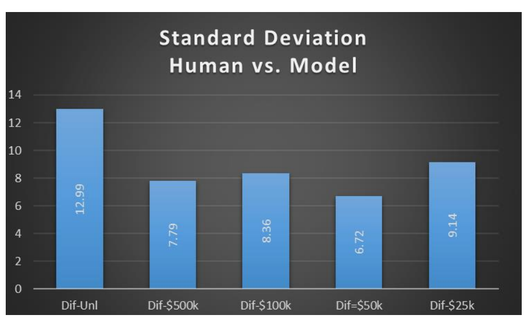
Above: The mean of the difference between model and human is highest for $100k and $50k.

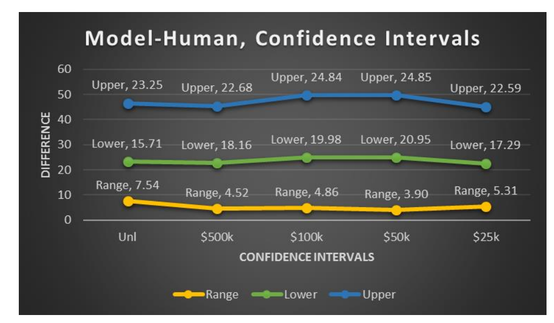
Below: Standard deviation is higher at max and min budgets, opposite of the difference curve above



Above: The model outperformed human scores with lower budget

Below: Confidence intervals for the mean of the difference in scores between model and human





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