Optimizing High School Graduation Rates

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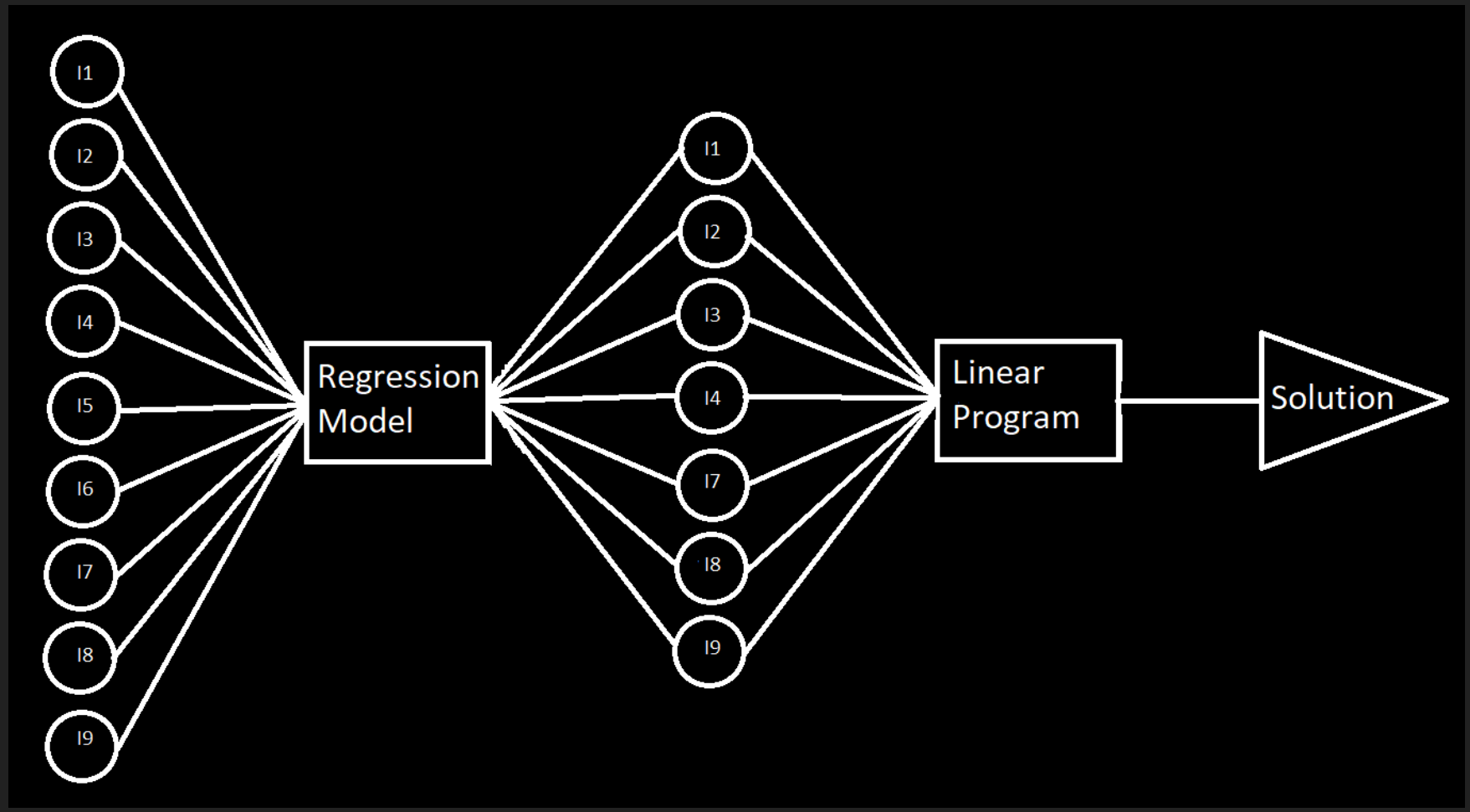
MATH 5593 Steffen Borgwardt

Regression And Optimization



Chosen Variables For Our Model

- Percent of the students in advanced classes (pAC)
- Demographic disparity between students and teachers (dD)
- Percent of male teachers (pMt)
- Student to teacher ratio (sTR)
- Turnover rate (tR)

Results of objective function

- $y = 98.33 + 46.26pAC - 19.3542dD - 8.80pMT - 0.047sTR + 1.54tR$

- Interpretation of some of these values:
  - 98.33 is the expected graduation rate if all other values are zero, not useful in final objective function.
  - $46.26pAC$ represents that an increase of 1% (0.01) in Advanced Classes increases the expected graduation rate by 0.4626%, similar to dD, pMT, and tR.
  - $-0.047sTR$ represents that an increase of 1 student per teacher drops graduation rate by 0.047%,

Constructed Constraints For Test Model

- Restrictions:
  - $-7.334\% \leq pAC \leq 10\%$
  - $-(\mathrm{tR} + 20.82\%) \leq dD \leq \mathrm{tR} + 20.82\%$
  - $-42.66\% \leq dD \leq 57.34\%$
  - $-(\mathrm{tR} + 20.82\%) \leq pMT \leq \mathrm{tR} + 20.82\%$
  - $-24.11\% \leq pMT \leq 75.89\%$
  - $-6 \leq sTR \leq 4$
  - $-20.83\% \leq tR \leq 30\%$
  - $\$1{,}842{,}000\ pAC - \$135{,}753\ sTR + \$750{,}000\ tR \leq 150{,}000$(or 0)

Results

Budget Increase $150,000

- pAC:(Percent Advanced Classes) +10%
- dD:(Demographic Disparity) -43%
- pMT:(Percent Male Teacher) -24%
- sTR:(Student Teacher Ratio) +1.9
- tR:(Turnover Rate) +30%
- Expected Graduation increase +15.38%

Budget Increase $0

- pAC (Percent Advanced Classes) +10%
- dD (Demographic Disparity) -43%
- pMT (Percent Male Teacher) -24%
- sTR (Student Teacher Ratio) +3.0
- tR (Turnover Rate) +30%
- Expected Graduation Increase +15.32%

Needs more research/ Extensions

- A few of the results show that more research is needed:
  - That this model suggests the percentage of male teachers is dropped to zero is controversial and shows that more research is needed for the impact of male/female teachers in the classroom.
  - Given that Student Teacher ratio has a very low priority, this potentially is a flaw in the models processing of the data.
- Possible extensions
  - Add more variables: Teacher experience, after school programs, parent education level, special education etc
  - Extend to include non-linear constraints and objective

References And Resources

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