Machine Learning Predicts Supreme Court Decisions

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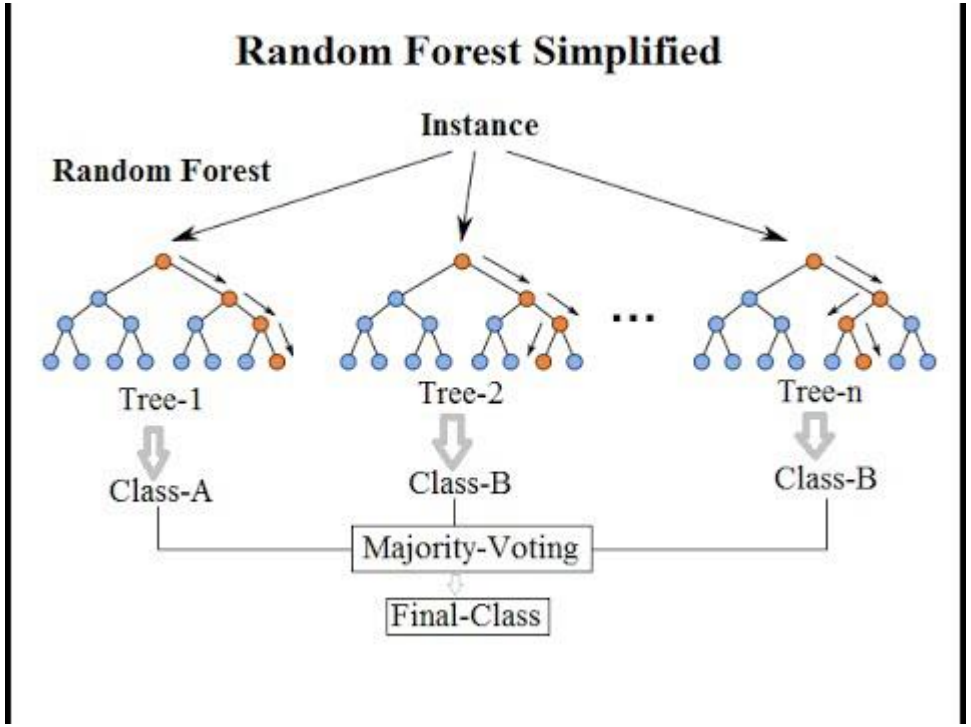
ORIGINAL PAPER BY DANIEL MARTIN KATZ , MICHAEL J. BOMMARITO II, JOSH BLACKMAN

Supreme Court of the United States

- 9 Justices
- Serve Average of 20 years
- Deliver in-depth decisions for over 100 cases per year
- Majority, Concurring, Dissenting Opinions
- That gives data for 2000 decisions per Justice!

Machine Learning Model

- Random Forest: Creates Regression of Trees to Predict Average Tree/General Behavior



- Adds new tree per decision
- Selects which tree to keep in model through grid-searching, split criterion, heuristic
- Changes only upon addition of court justices

Data Collection

- SCDB (Supreme Court Database)
- Justice Disposition Divided into 3 Categories:
  - Affirm
  - Reverse
  - Other
- Case Outcome based on Majority of Justices' Decision

Class	Justice	Case
Affirm	113,454	16,718
Reverse	93,161	11,291
Other	37,267	NA
Total	243,882	28,009

- Features to Summarize Behavior of Justice

Results: Standalone

- Surprisingly Accurate: Most Current Models to Predict Supreme Court are no better than 50%
- Results for Individual Justice Decisions:

Class	Precision	Recall	F1-score	Support
Not Reverse	0.70	0.78	0.74	153,206
Reverse	0.57	0.46	0.51	93,569
Mean/Total	0.65	0.66	0.65	246,775

- Results for Overall Case Outcome:

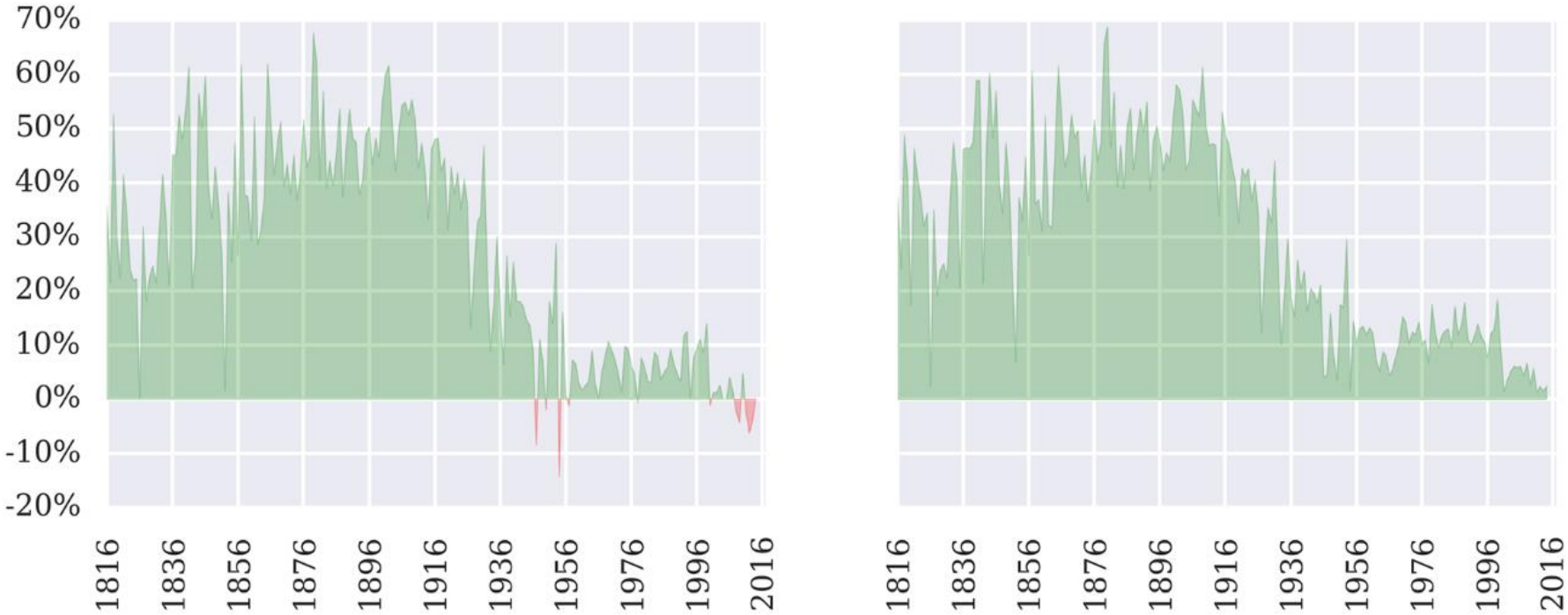
Class	Precision	Recall	F1-score	Support
Not Reverse	0.69	0.81	0.75	16,740
Reverse	0.63	0.47	0.54	11,340
Mean/Total	0.67	0.67	0.66	28,080

Results: Three Baseline Models

- Always Guess Reverse
- Infinite Memory
- Optimized Finite Memory Model

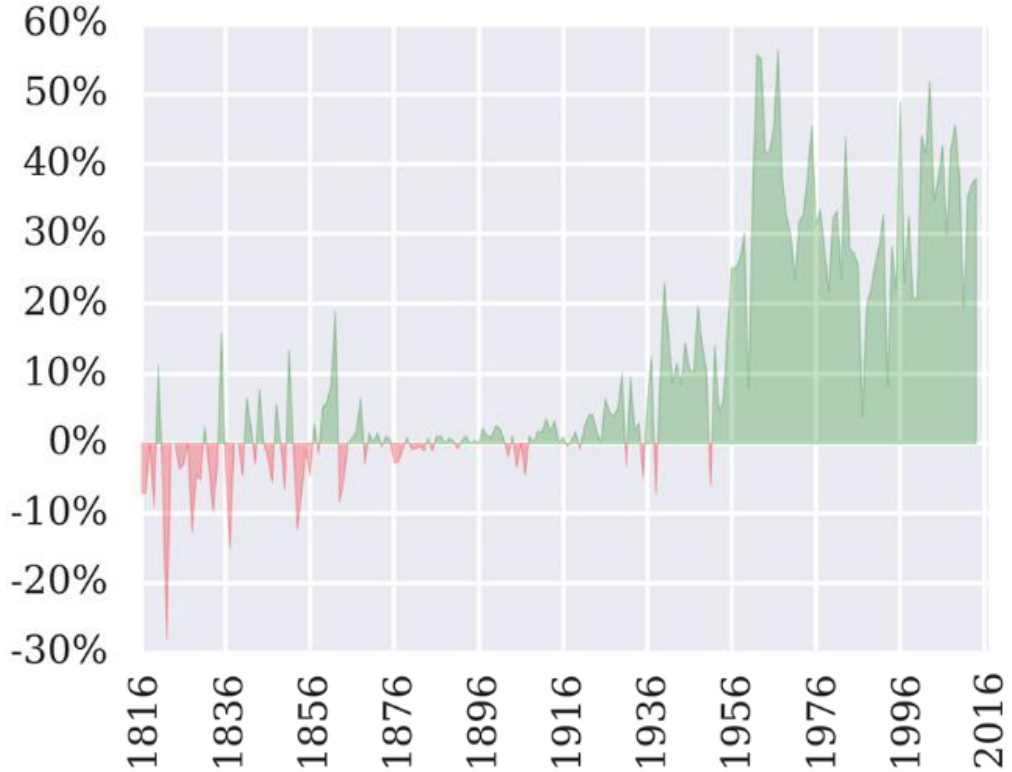
Always Guess Reverse

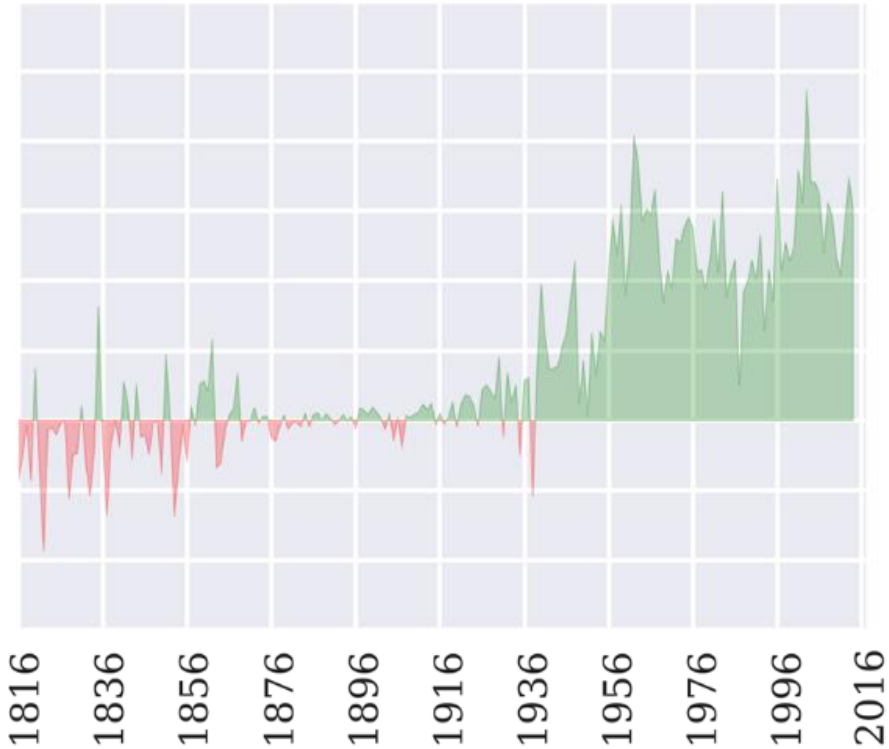
- Historically, Supreme Court reverses Decision
- Graph demonstrates Machine Learning Model Performance compared to Baseline
  - Green means the Machine Learning Model performed better, Left is Case Outcome and Right is Justices' Outcome



Infinite Memory

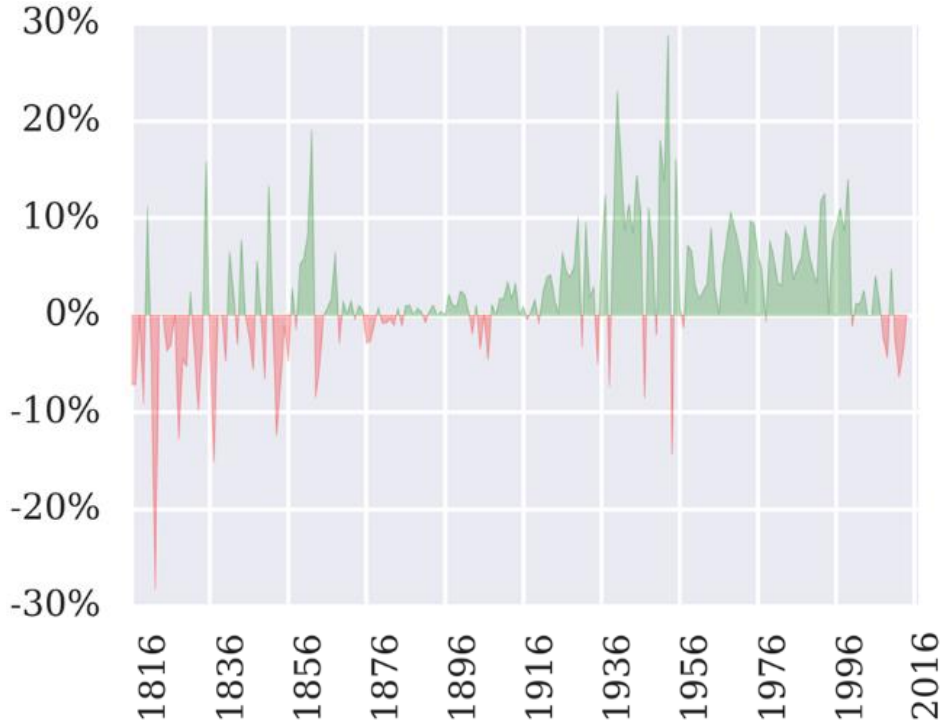
- Average out Decisions since Beginning of Supreme Court
- MLM Better at Predicting Modern Years than Earlier Years

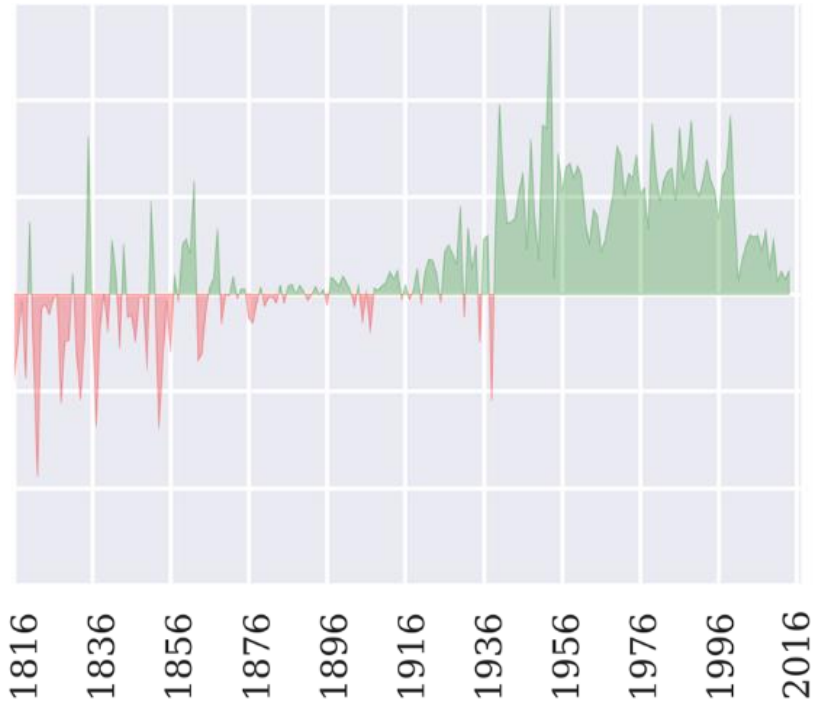




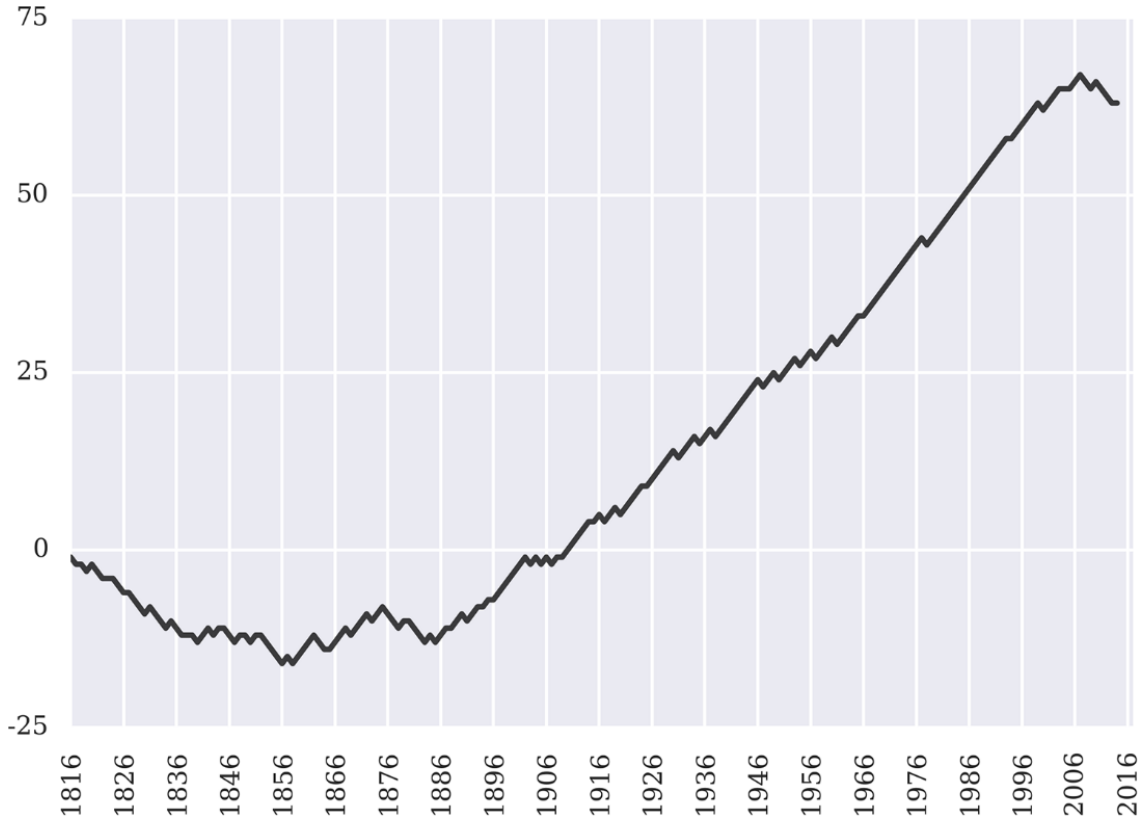
Optimized Finite Memory Model

- Use finite window around case to determine outcome





Consistency, Accuracy, Generality



- Consistency: Same Results Every Time
- Accuracy: Close to Real Outcome
- Generality: Works No Matter Who is on Supreme Court

Out-of-Sample Applicability

- All information required for model needs to be known beforehand
- Model can be exported to other law problems:
  - Jury Selection
  - Negotiating Plea Deals
- Doesn't have to be just law problems:
  - Predict Referee Decisions in Sports
  - American Idol finalists, Miss Universe, and other entertainment judging
  - Market/Public Reaction to Policy and Decisions

Conclusion

- Relatively Accurate Model
- Works well with Predicting Past Cases
- Future:
  - Adapt model to take in more inputs to allow for prediction of future cases
  - Sell model to both parties, so best arguments are put forth
  - Increase accuracy

- The future will rely on such machine learning models to use blend of experts, crowds, and algorithms to create accurate predictions

References

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