

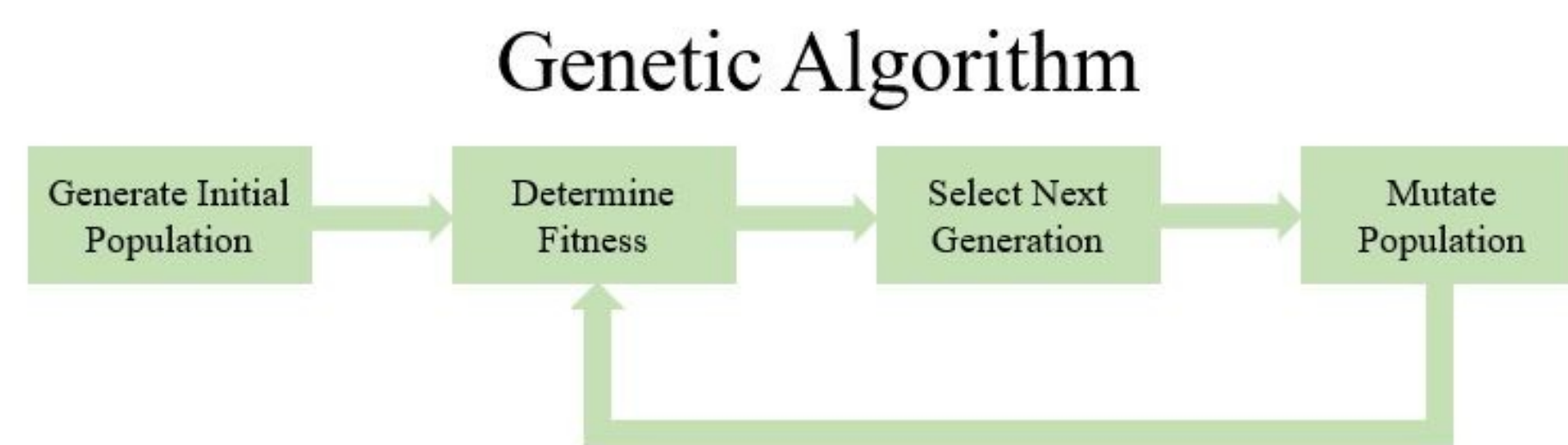
# Characterizing the Affect of Down-Sampling on Specialist Preservation

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## Research Question

How does random sub sampling affect a genetic algorithms ability to preserve specialists?

## Background



Genetic algorithms evolve candidate solutions in order to solve mathematical and engineering problems.

## Introduction

- Selection schemes aim to pick the best candidate solutions to reproduce.
- Candidate solutions can be categorized as generalists or specialists.
- Specialists are candidate solutions that are exceptional at solving a few tests.
- Preserving specialists is important because they ensure that no tests are ignored, and more options are explored for finding a perfect solution.
- Traditional selection schemes (e.g., Roulette and Tournament) often struggle to preserve specialists.
- Lexicase is a selection scheme that preserves specialists by continuously shifting which test cases are most important.

## Methods

- 30 experimental conditions with differing configuration variables was created.
- Data sets were created using the 30 experimental conditions.
- Selection probabilities for each individual was calculated for every selection scheme used.
- A Kruskal-Wallis test was performed to see if there is a significant difference in the probability a selection scheme selects a specialist.

## Conclusions

Random sub sampling negatively affects Cohort Lexicase's ability to preserve specialists.

## Future Directions

Future research will hopefully shed light on how down-sampled lexicase was able to preserve specialists at a higher rate than other randomly sub sampled lexicase variants.

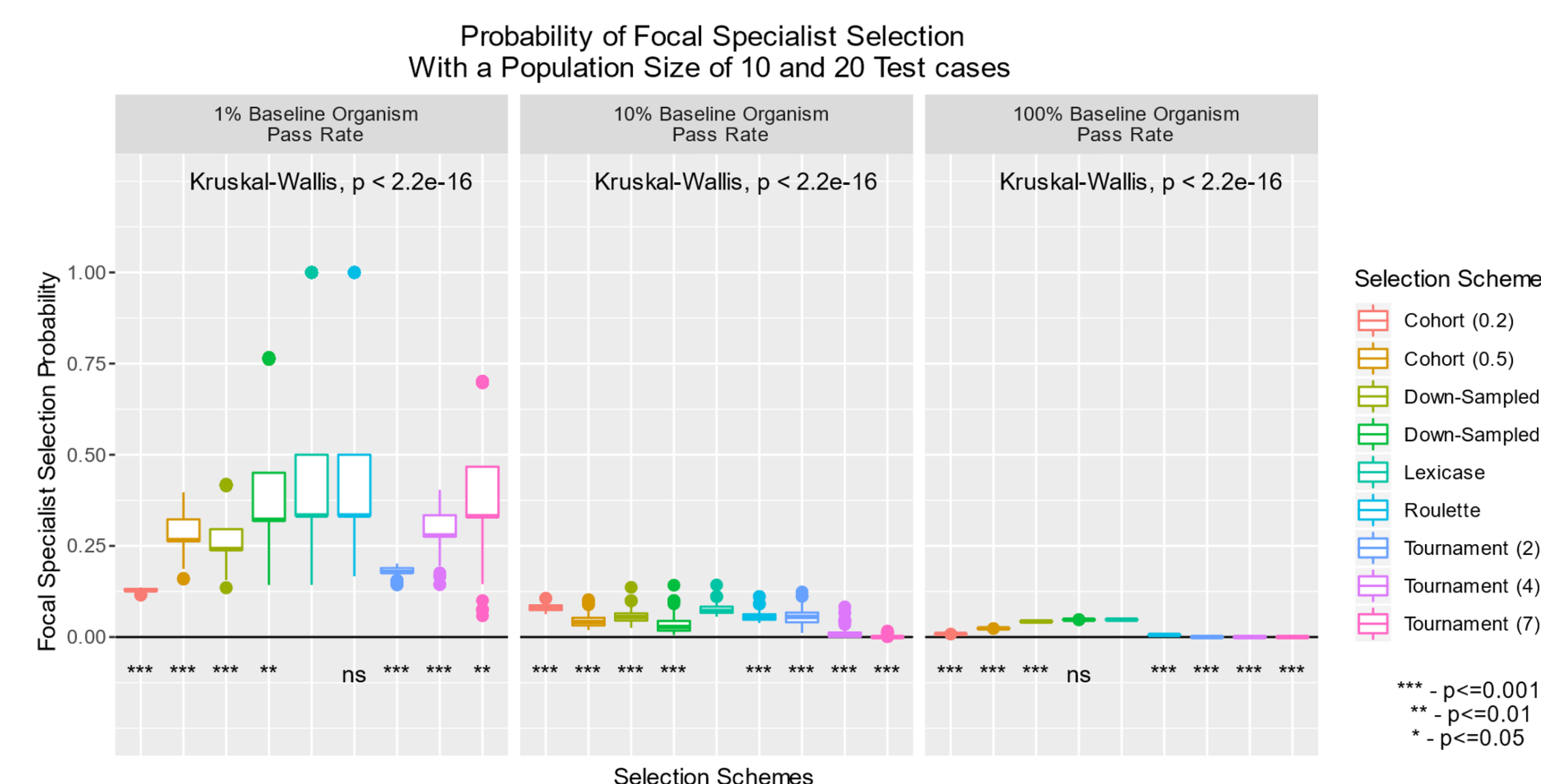
## Acknowledgements

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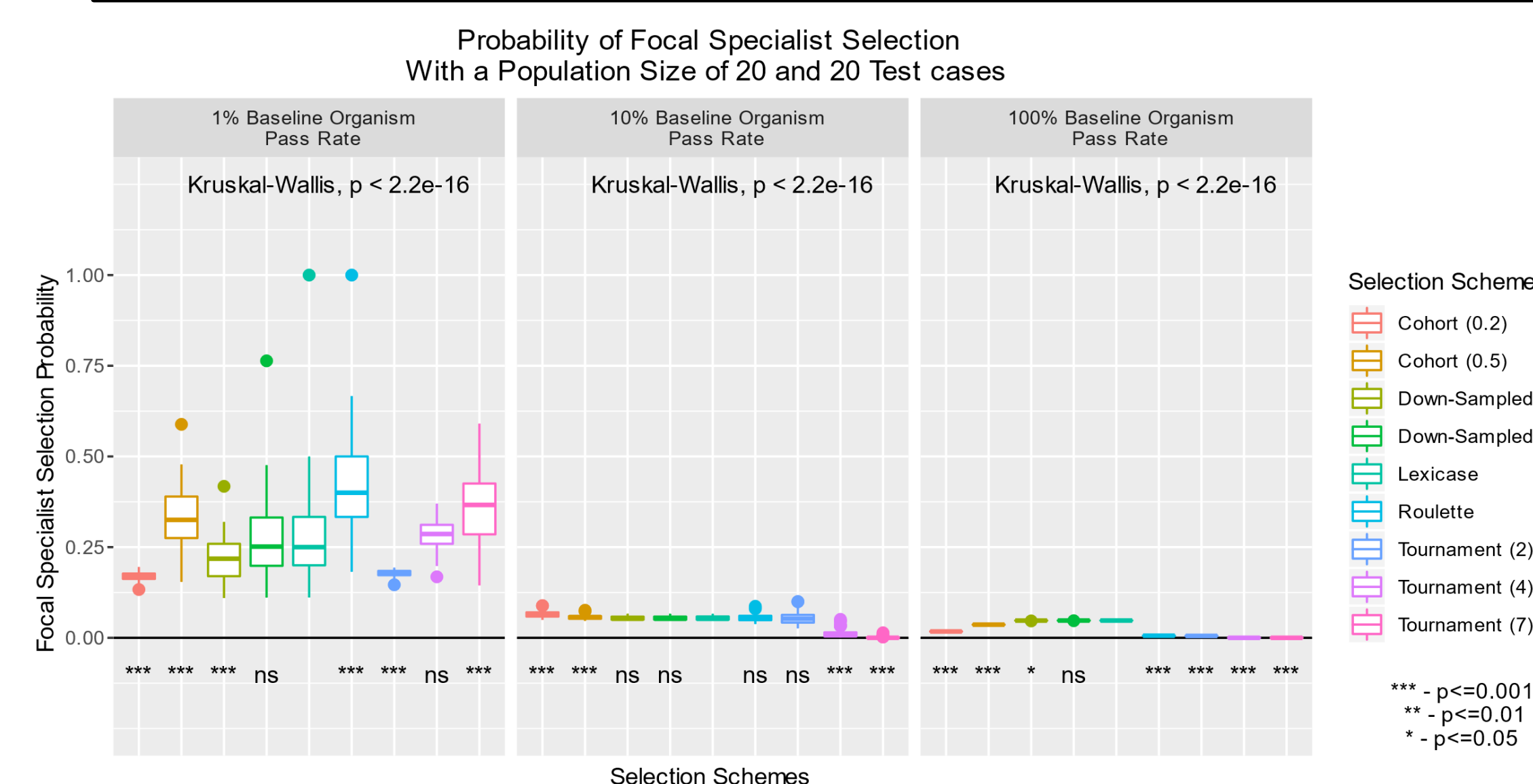
## References

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## Results



**Figure 1.** Shows a statistically significant difference in the probability a specialist will be selected between Lexicase and its sub sampled variants.



**Figure 2.** Shows a statistically significant difference in the probability a specialist will be selected between Lexicase and Cohort Lexicase.