# Project Summary

*Short summary of the project setting.*

# Propositions

*List of the propositions used in the model, and their (English) interpretation.*

* Bi,j : This is **True** for position (i, j) if there is a black stone in it.
* Wi,j : This is **True** for position (i, j) if there is a white stone in it.
* Si,j : This is **True** for position (i, j) if there is a white stone at position (i, j) and if it is surrounded by 4 other stones in each cardinal direction.
* Oi,j : This is **True**for position (i, j) if the position is "out of bounds".
  + Out of bounds is defined as where **i or j** are not in the range **[0,n)**
* R:  **True** when all white stones can be taken, **False** when not all white stones can be taken

# Constraints

*List of constraint types used in the model and their (English) interpretation. You only need to provide one example for each constraint type: e.g., if you have constraints saying “cars have one colour assigned” in a car configuration setting, then you only need to show the constraints for a single car. Essentially, we want to see the pattern for all of the types of constraints, and not every constraint enumerated.*

Stones of two types cannot share the same position. A spot with a white stone cannot also have a black stone on it and vice versa.

Any position that is out of bounds we will consider to be a black stone. So, if a position is out of bounds there is a black stone on it.

For any position, a stone is surrounded if it is a white stone that is surrounded by either a white or black stone in all cardinal directions.

If there is a white stone that is not surrounded on all four sides by other stones, then all white stones are not captured in this position ().

# Model Exploration

*List all the ways that you have explored your model – not only the final version, but intermediate versions as well. See (C3) in the project description for ideas.*

It seems that our initial model works pretty well, having correctly evaluated most edge cases we could think of.

# Jape Proof Ideas

*List the ideas you have to build sequents & proofs that relate to your project.*

For a single white stone that is surrounded by black stones, prove that it is surrounded.

If there are no white stones, prove that all white stones are captured.

If the board is all white stones, prove that all white stones are captured.

If there exists a position that is out of bounds, then there exists a black stone.

If a board has all white stone prove there are no black stones.

For a single white stone surrounded by two black stones, prove it is not captured.

Some mostly completed proofs can be found adjacent to this file.

# Requested Feedback

*Provide 2-3 questions you’d like the TA’s and other students to comment on.*

# First-Order Extension

*Describe how you might extend your model to a predicate logic setting, including how both the propositions and constraints would be updated.* ***There is no need to implement this extension!***

## Propositions

* White (i,j): There is a white stone at position (i,j)
* Black(i,j): There is a black stone at position (i,j)
* Surround(i,j): The stone at location i,j is surrounded in all cardinal directions by other stones.
* Out(i,j): The position (i,j) is outside of the bounds of the board.
* Captured: True if all white stones can be taken and false otherwise.
* Equality: Allows us to set the state of a proposition directly.

## Constraints

* Stones of two types cannot share the same position.
* Any position that is out of bounds is considered a black stone.
* If a white stone is surrounded by white or black stones in each cardinal direction, then it is surrounded.
* If there is a white stone that is not surrounded, then not all stones can be captured.

# Useful Notation

*Feel free to copy/paste the symbols here and remove this section before submitting.*