# Project Summary

*Short summary of the project setting.*

* User identification – we will have an initial long message to start (including emojis) and we will have to identify which user sent the message based on our set constraints of each user
* Using predicate logic, we will be able to narrow down which user has sent the message, based on the propositions generated from the message given, as well as the constraints we generated for each user.

# Propositions

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

* **S**: Plays soccer
* **T**: Plays soccer intramurals
* **B**: Plays music
* **G:** plays guitar
* **D:** Student
* **Q**: Student at Queen’s
* **C**: In a school club
* **F:** Taking a specialization
* **P:** classes in-person
* **A**: 1st year student
* **R**: Living on-residence

#### Users:

* NG: Nicholas
* AM: Amanda
* VU: Vanshita
* AC: Adam
* JR: Jimmy
* MP: Moira
* GG: Gary

# 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.*

* NG → S ∧ D ∧ Q ∧ F ∧ P
* AM → S ∧ T ∧ D ∧ Q, ∧ C ∧ F ∧ P
* VU → B ∧ D ∧ Q ∧ C ∧ F ∧ P
* AC à S ∧ T ∧ D ∧ Q ∧ F ∧ P
* JR → S ∧ G ∧ B ∧ K ∧ D ∧ C ∧ A ∧ R
* MP → S ∧ T ∧ B ∧ P ∧ D ∧ C
* GG → G ∧ B ∧ S
* T ∨ Q ∨ C ∨ F ∨ P ∨ A ∨ R à D
* Q ∧ Aà R
* T à (S ∧ D)
* F à A
* B à G
* G à B
* C à D
* S à NG ∨ AM ∨ AC ∨ JR ∨ MP
* T à AM ∨ AC ∨ JR ∨ MP
* B à VU ∨ JR ∨ MP ∨ GG
* G à JR ∨ GG
* D à NG ∨ AM ∨ VU ∨ AC ∨ JR ∨ MP
* Q à NG ∨ AM ∨ VU ∨ AC
* C à AM ∨ VU ∨ ∨ JR ∨ MP
* F à NG ∨ AM ∨ VU ∨ AC
* P à NG ∨ AM ∨ VU ∨ AC ∨ MP
* A à JR
* R à JR

# 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.*

# *Current Idea*

* Given a specific message (sent from one of the 7 users), we will conclude which user(s) sent this message based on the given constraints each user has.
  + This might look something like this:
    - “I play soccer intramurals, and I am a student at Queens, and I am taking a specialization.”
    - From this, using python and our jape proofs, we will be able to conclude that this message could have been sent from: Amanda, or Adam

#### Previously Explored Ideas:

* Given a specific message, once again, sent from one of the 7 users, we would generate a response using emojis.
  + Our response would be generated through reactions that included agreement/disagreement, laughter/crying, and celebration.
  + *How does this differ from our current idea?*
    - Instead of generating a response with emojis, we are now simply going to conclude which user sent the message that was given to us.

# 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!***

* Our propositions will be the users themselves and characteristics
* Our constraints are what makes up the users, as well as implications of certain characteristics
  + Using these constraints, we will be able to conclude on which user(s) sent the message
* The message given to us would be translated to predicate logic and be used as the premise in our jape proof. Using our constraints of each user, along with implications, we will be able to conclude which user(s) sent the message.

#### Jape Proofs:

1. Our first proof is simply proving a constraint. Our main goal here is to build up propositions in order to match a user to the total propositions at the end of our main premise (which would be the message sent). This is simply one step, which allows us to conclude that when the user plays soccer intramurals, we know the user is also a student and they play soccer.

![Table

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1. Here we have another basic constraint proof which simply allows us to conclude that a student living on residence is also a first-year student and a student at Queen’s.

![A picture containing table

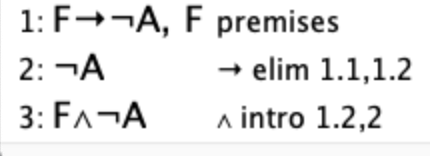
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1. In the following jape proof, we show that if we know the user is a Queen’s student, and they do not live on residence and they are not a first year, then they are a Queen’s student and they are taking a specialization.

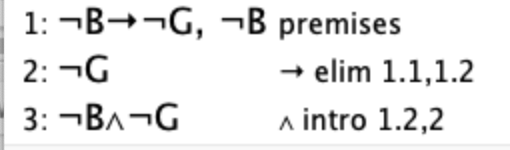
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Description automatically generated

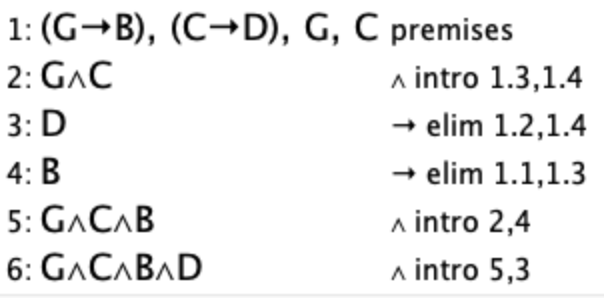
1. In this next proof, it illustrates that given our constraints; F(Taking a specialization) implies that ¬A(1st year student). Then if a given user is taking a specialization we can conclude that they are taking a specialization(F) and(∧) they are not a first year student(¬A).



1. Another constraint we’ve listed is the limitation that a user that does not play music (¬B) implies (à) they also do not play guitar(¬G) and thus, we can conclude that the message must have been sent by a user that does not play music (¬B) and(∧) they don’t play guitar (¬G).



1. Finally, the following proof combines two simple constraints; a user that plays guitar(G) implies (à) they play music(B), a user that is in a school club(C) implies (à) they are a student(D). Therefore, given a user that plays guitar(G) and is in a school club(C) we can prove that the user plays guitar(G) and(∧) they play music(B) and(∧) they are in a school club(C) and(∧) they are a student.



#### Python Implementation:

* In python, the user is presented with an interface of all the characteristics that he can select.
  + The user can continue selecting characteristics until he enters ‘END’
  + \*\*We must make sure that after selecting Specialization, that the user cannot continue to select first year student, or living on residence\*\* (based on our constraints)
* After the user enters certain characteristics, the program outputs which user(s) matched to those characteristics

# Requested Feedback

*Have a list of questions you want answered.*

***How would we go about implementing our idea into python?***

***Any suggestions on how to setup our jape proofs to be able to conclude to specific user(s)?***

***Should we implement more (complicated) constraints?***

***Any other improvements/suggestions/ideas for implementation of the overall idea into python?***

# Useful Notation

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