

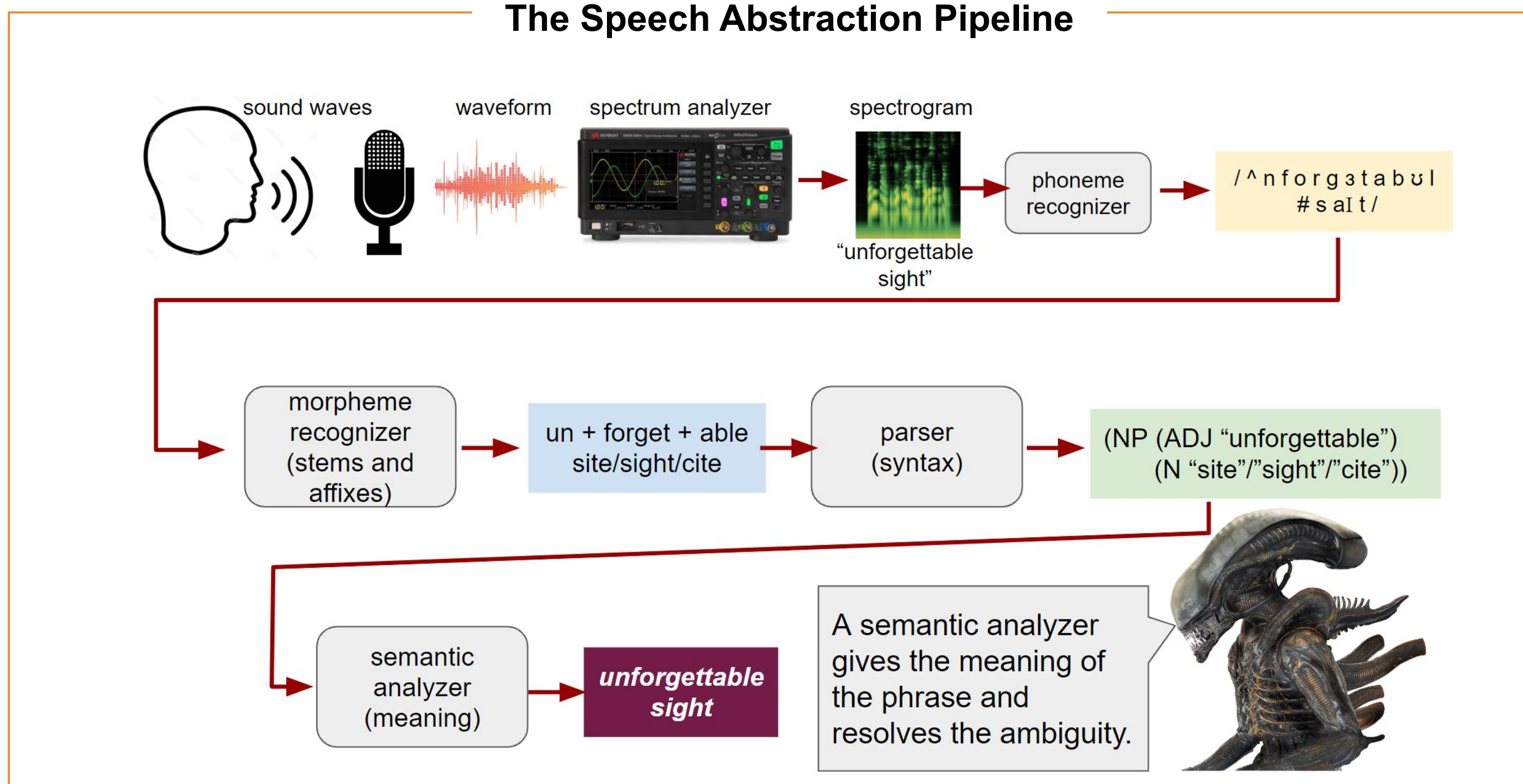
Our AI4GA (AI for Georgia) project piloted a nine-week elective, *“Living and Working with Artificial Intelligence,”* with five Georgia middle school teachers and 299 students.

MIDDLE SCHOOL LEARNERS IN ELECTIVE COURSES

- Strong preference for activity and design-based learning over knowledge mastery or lecture-based instruction.
- Expect electives to be fun and entertaining.
- Willing to examine serious topics, such as societal impacts of self-driving cars, especially when given a menu to choose from.
- Comfortable working on individual assignments or research projects.
- Have Chromebooks or laptops but also want time away from the computer (unplugged and hands-on activities).

INVESTIGATING SPEECH RECOGNITION

The Speech Abstraction Pipeline

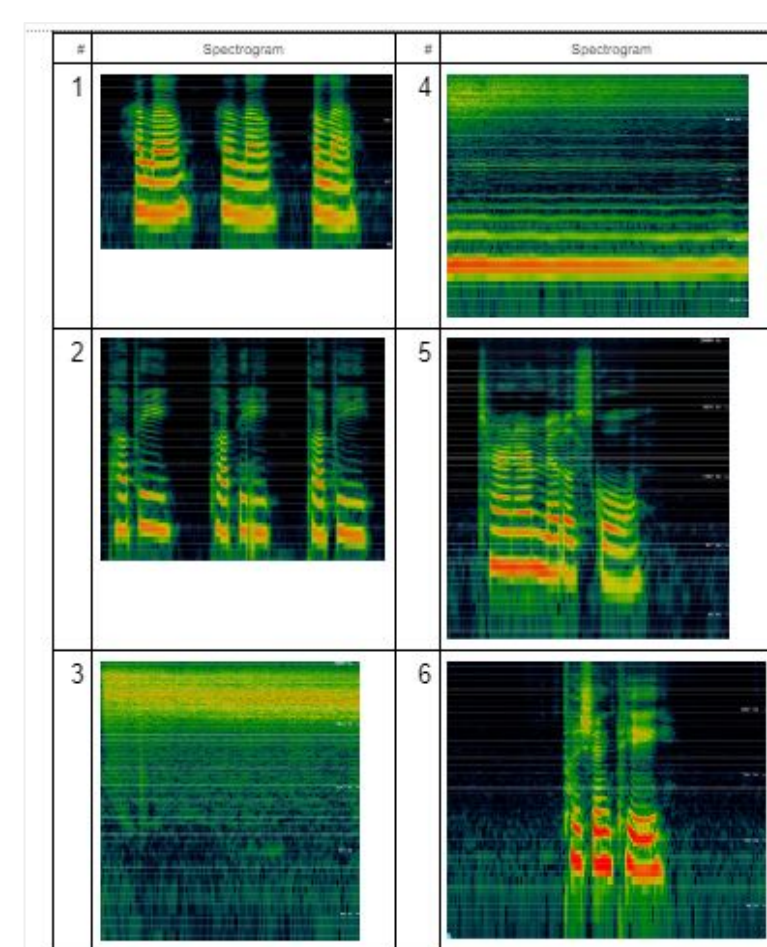


Activity #2: Spectrogram Word Match

Look at the spectrograms and try to match them to the correct phrase based on the pattern of frequency.

Follow the link and say the words below. Write the letter number next to the correct sound, word, or phrase.

Say	Spectrogram
"Sssssssssss"	
"Hello Hello Hello"	
Turner Middle School"	
"Zzzzzzzzzzzzz"	
"Puppy Puppy Puppy"	
"Pushin P"	



Activities

Speech Recognition Demo

- the brave knight fought a dragon last night
- the brave night fought a dragon last night
- the brave night for the dragon last night
- the brave night Florida Dragon last night
- the brave knight for the dragon last night

Activity 3: Speech Recognition Demo

In this activity you will test out a speech recognizer in chrome. Try out the examples below to discover when it understands best and when it struggles to understand.

Circle the word it guessed.	Say the whole sentence.	Did the computer get it correct?
brake / break	I told her if she didn't hit the <u>brake</u> in time she would <u>break</u> the garage door.	✓
flour / flower	You'll need some <u>flour</u> to bake a <u>flower</u> -shaped cake.	✓
knight / night	The knight fought a dragon last <u>night</u> .	✓
knight / night	The brave knight fought the dragon last <u>night</u> .	✗

Use the link in class to choose a homonym pair. Write your own homophone sentences. Say your sentences to the computer. Did the computer get it correct?

rate (roar) He told me where the rats were.

mail (male) She told me where the mail was.

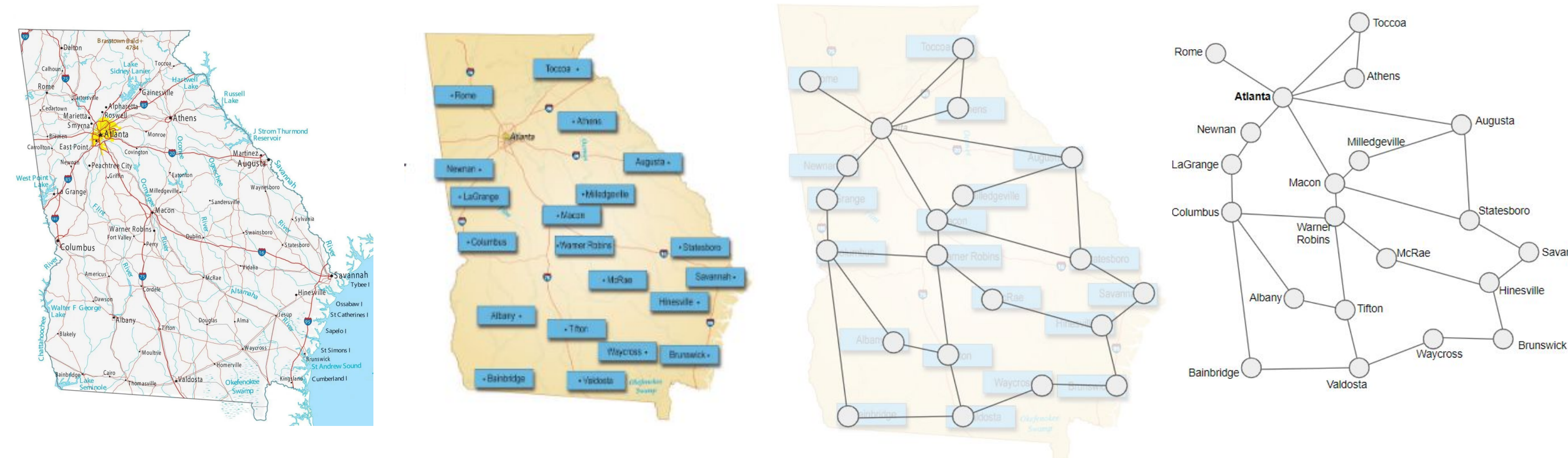
Lessons Learned

- Students enjoyed the spectrogram matching activity because they were able to use their own voices to generate spectrograms.
- Students enjoyed trying to “fool Google” by making up sentences containing homophones to see if it could resolve them correctly.

Next Steps: Evaluate students' overall understanding of the speech abstraction pipeline.

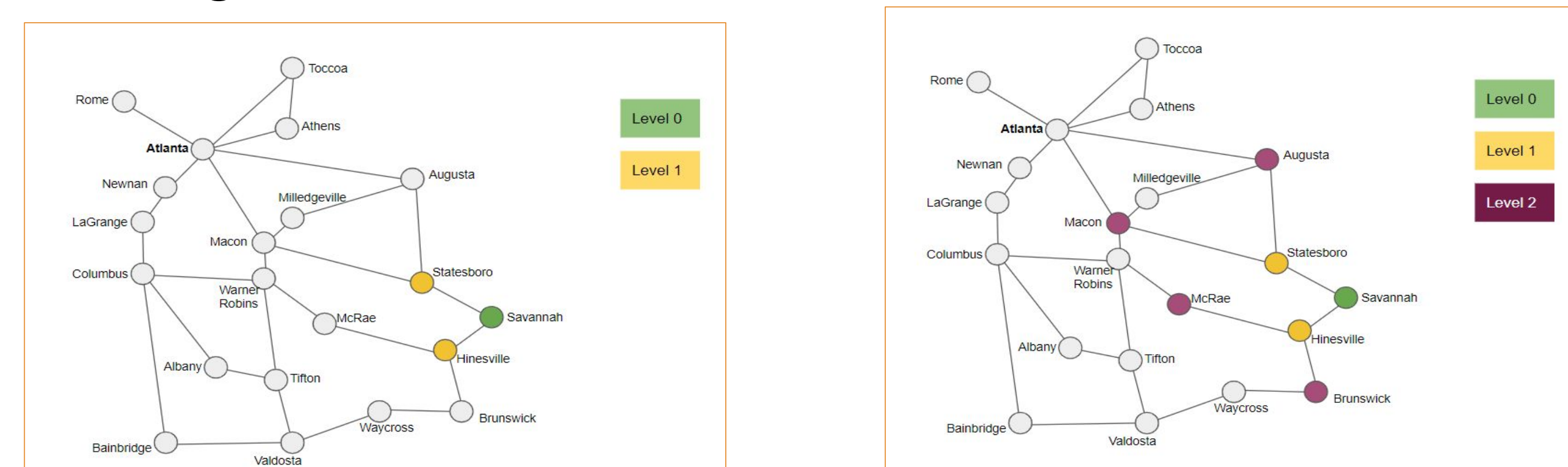
ROUTE FINDING BY BREADTH-FIRST SEARCH

Abstracting from a Map to a Graph



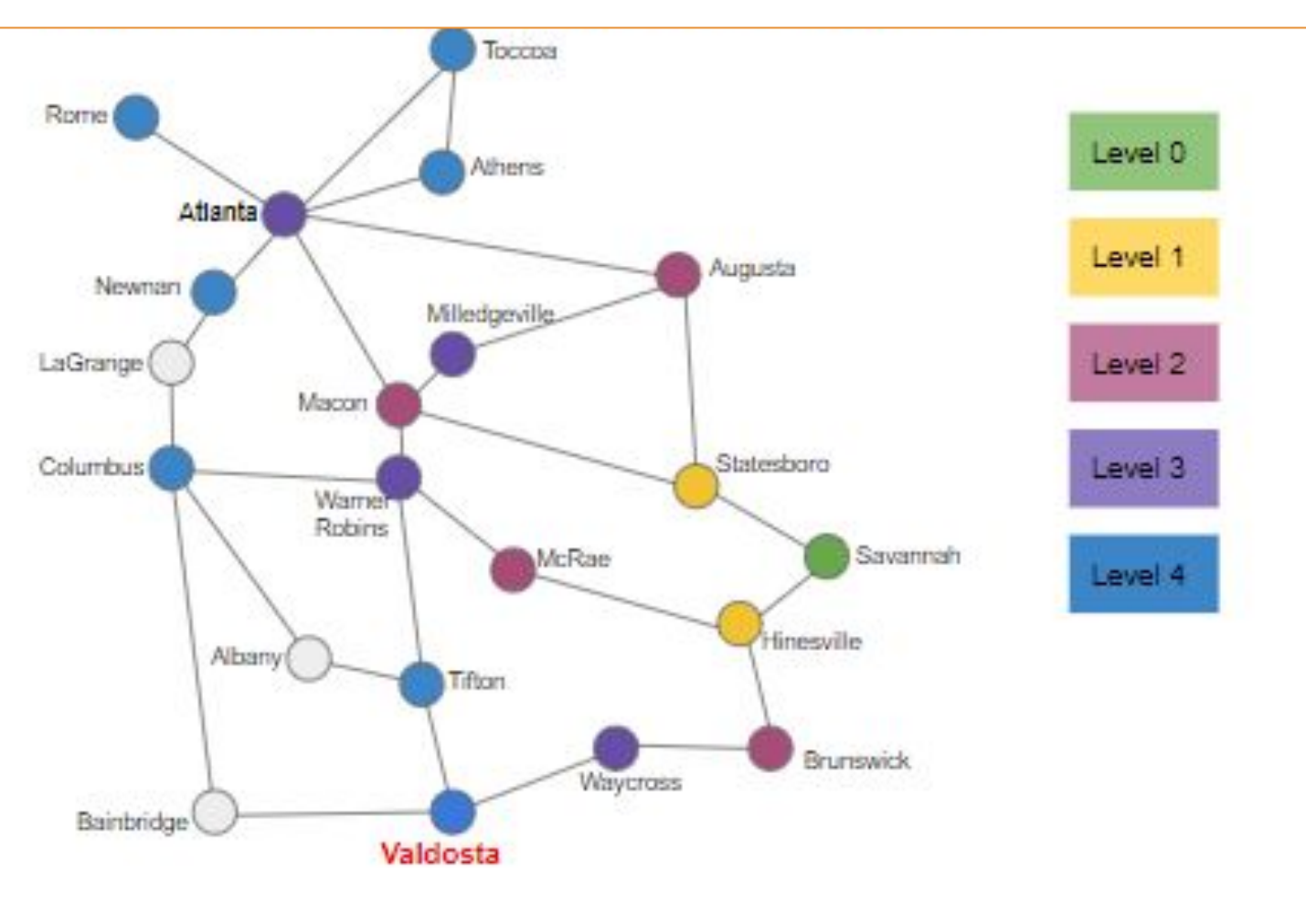
Route Finding by Graph Coloring

How to get from Savannah to Valdosta?



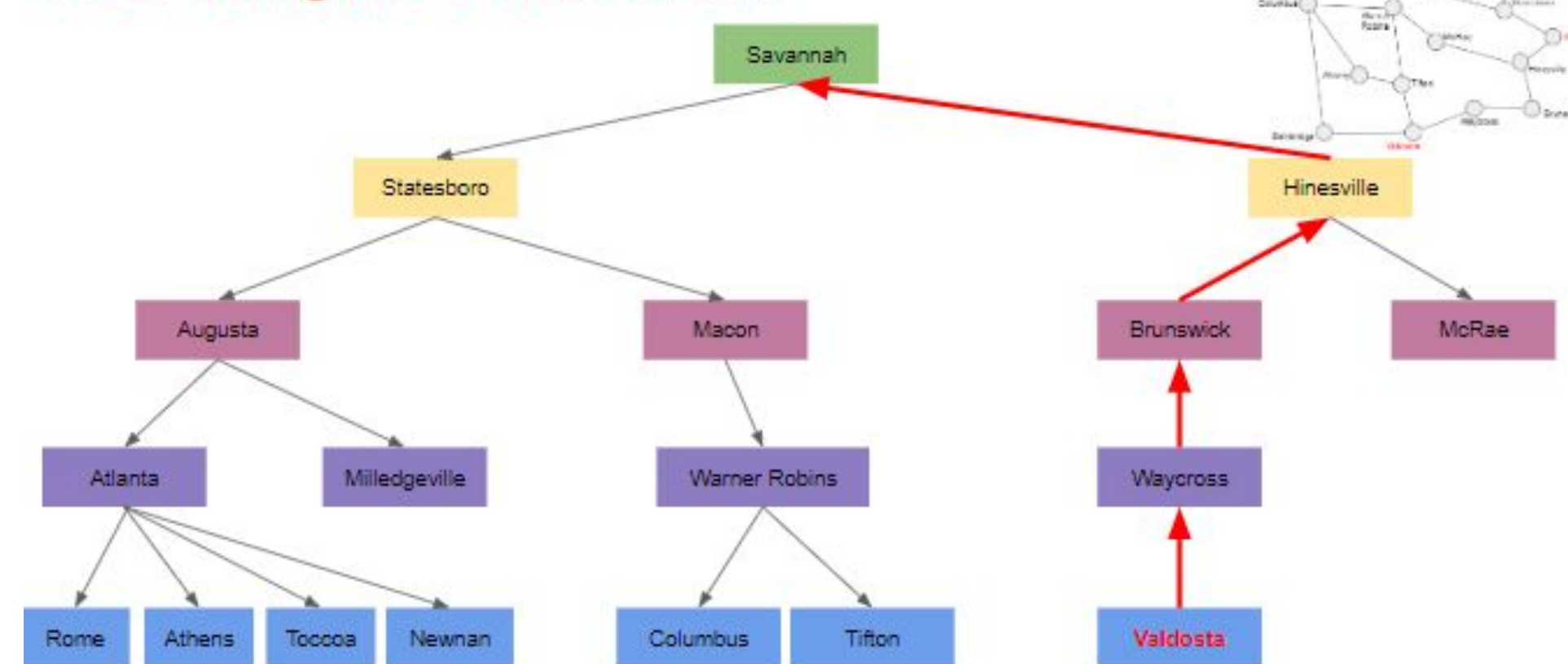
Color the uncolored neighbors of level 3 cities as level 4.

This includes our destination city, Valdosta.



Route Finding by Constructing a Search Tree

Breadth-First Search: Savannah to Valdosta



Lessons Learned

- Students enjoyed the graph coloring because it was an unplugged activity.
- A teacher reported scaffolding this activity by first modeling the procedure, then having students work in pairs, and finally working individually for assessment.
- *Common student mistakes:* missed coloring a city, trying to color a city twice, not stopping when the goal was reached, and not inverting the final route.

Next Steps: Evaluate students' understanding of constructing and reasoning with search trees.

PROGRAMMING PROJECTS

Computer Vision - Face Filters in Scratch Lab

The screenshot shows the Scratch Lab interface for face filters. It includes a 'Face Sensing' block with a 'when clicked' event and a 'forever' loop containing 'go to between eyes', 'point in direction of face tilt', and 'set size to face size'. Below the code are two photos of a student using a face filter that adds blue sunglasses.

<https://lab.scratch.mit.edu/face/>

Students can select fashion sprites and costumes from the Scratch library and attach them to different facial landmarks (eyes, nose, forehead, chin, etc).

Sentiment Analysis in Cognimates

The screenshot shows the Cognimates interface. It displays a rating of 'neutral' for the question 'How are you doing today?'. Below the rating are three sprites: Abby (Neutral), Abby (Happy), and Abby (Sad). The 'Sprite: Abby' section shows three options: Negative, Happy, and Neutral. The 'Rating' section shows three options: 'I am fine', 'I am not fine', and 'I am very fine'. The 'Sentiment' section shows three options: 'When text is negative', 'When text is positive', and 'When text is neutral'. The 'Switch costume to' section shows three options: 'Abby-c', 'Abby-h', and 'Abby-n'.

<https://Cognimates.me>

Students can choose sprites with a range of costumes that highlight different emotions to match the sentiment analysis outputs.

Path Planning in Calypso

The screenshot shows the Calypso interface for path planning. It includes a 'Green light, good to go' block and a 'Puzzle' block. Below the code is a diagram of a robot navigating a path through a maze of obstacles.

<https://Calypso-Robotics.com>

Lessons Learned

- Students with prior Scratch programming experience enjoyed using the AI Plugins.
- Students enjoyed designing and trying out their own face filters.
- Students wanted more opportunities to build AI artifacts.
- Students enjoyed creating their own multi-room apartments in Calypso and watching the robot navigate between rooms and around obstacles.

Next Steps: Evaluate students' artifacts.