MICHIGAN STATE
U N I V E R S I T Y

Project Plan Presentation
Aircraft Appearance Assessment Tool

The Capstone Experience

Team United Airlines Quality Assurance

Tony Kovari
Avi Lochab
Kenny Mei
Han Nguyen
Nandini Tengli
Shaojie (Jay) Zhang

Department of Computer Science and Engineering
Michigan State University

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From Students…
…to Professionals

United Airlines Overview

- "**Connecting People. Uniting the World**"

- Major American airlines head-quartered in Chicago

- Most comprehensive route network in the US

- Serves 332 destinations: 252 domestic and 80 international

Project Functional Specifications

- Automatic assessment of aircraft images
  - Gives a score rating based on aircraft condition
- Funnel in emails of issues with aircraft conditions from UA
- Extraction of tweets and images from Twitter
  - Pertaining to UA's aircraft conditions, both negative and positive feedback
- Search for aircrafts with a specific identification number

Project Design Specifications

- Review aircraft pictures from Twitter, employees, and Gmail

- Edit/Update information for bad pictures

- Upload pictures and receive a quality rating for each of them

- Search for pictures and information related to a specific aircraft number
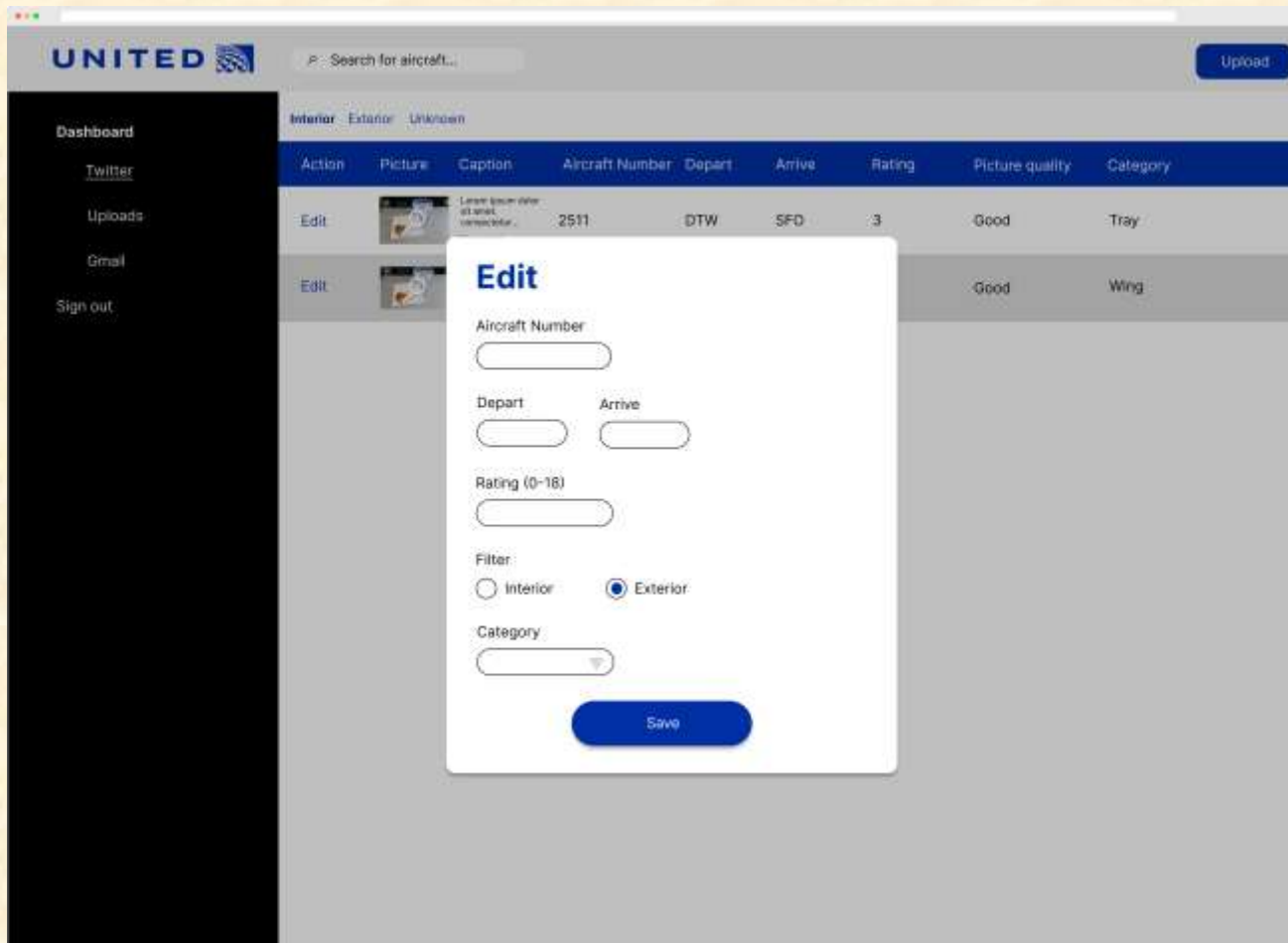
Screen Mockup: Dashboard Page

Screen Mockup: Edit Window

Screen Mockup: Upload Page

Screen Mockup: Summary Page
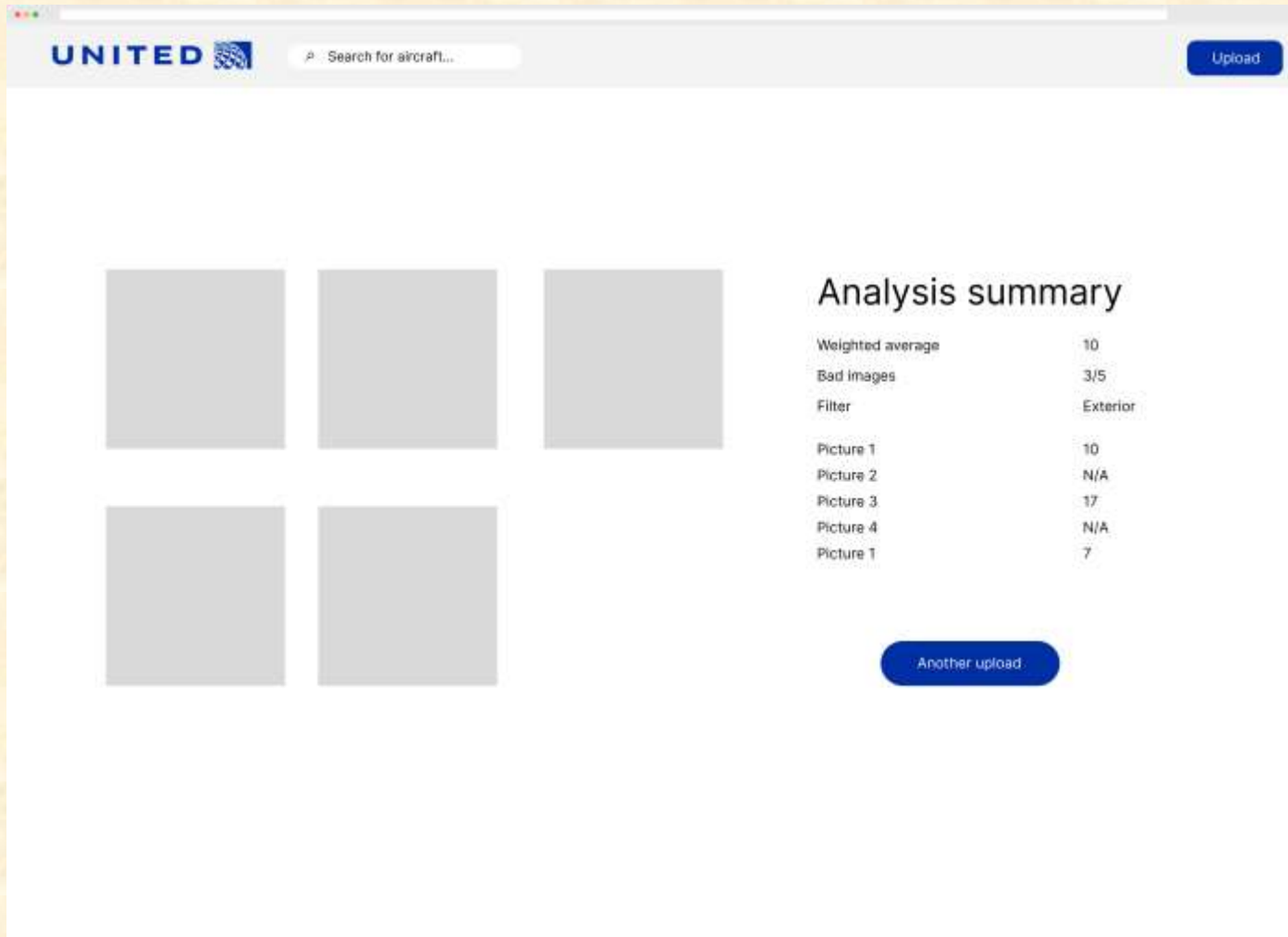
Screen Mockup: Search Result Page

Project Technical Specifications

- Deep Convolutional Neural Network to classify images

- Tweepy and Google Client Library to help extract images

- Every Twitter post is saved into the database

- Test plan
  - Small -> Big Scale - > Fine tuning

Project System Architecture
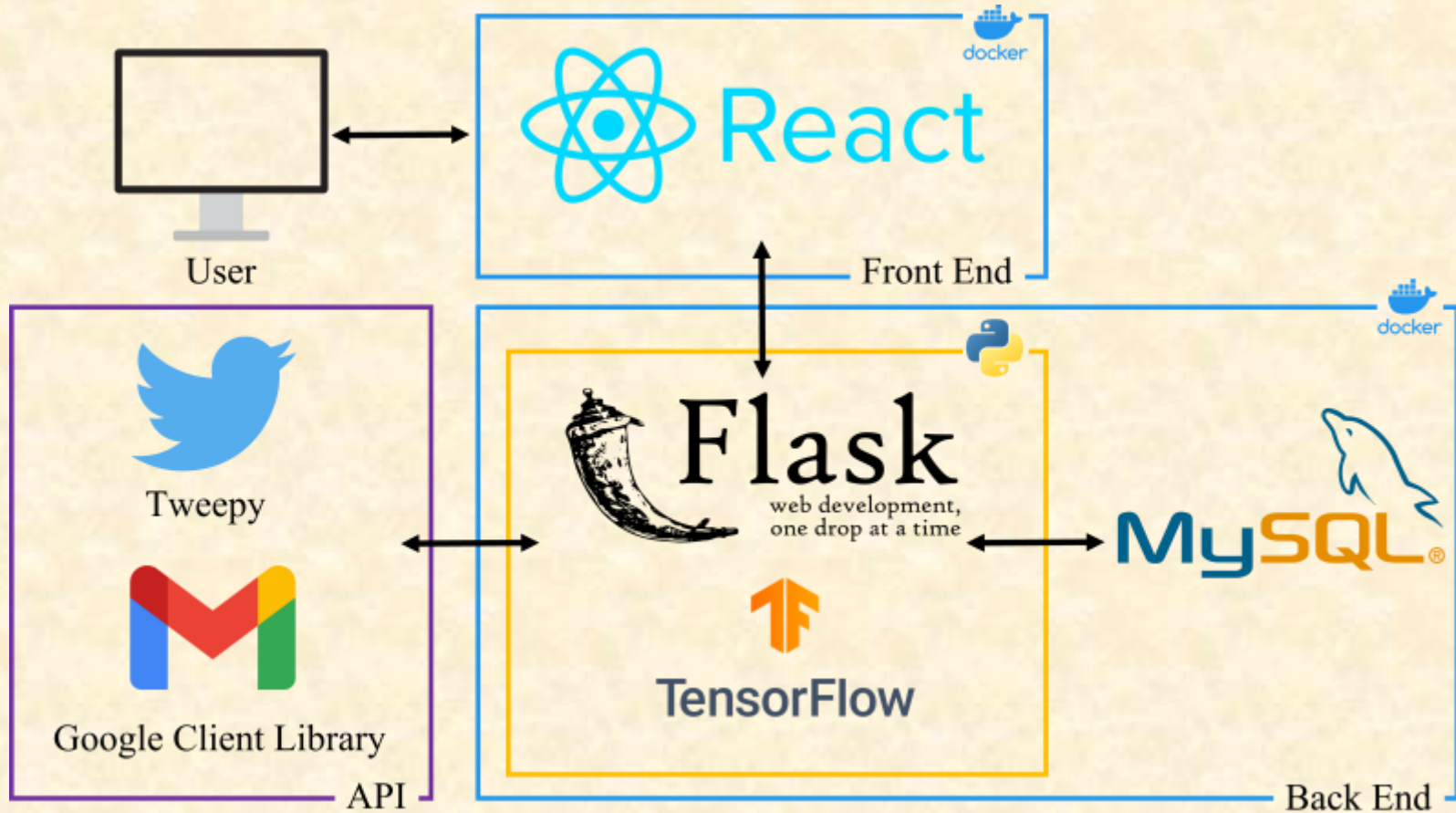
Project System Components

- Hardware Platforms
  - Capstone iMac

- Software Platforms / Technologies
  - JavaScript: React
  - Python: Flask, TensorFlow, Tweepy, Google Client Library
  - Docker

Project Risks

- **Communication between Twitter API and ML model**
  - **Description:** We're still researching how to provide our local ML model with Twitter data for analysis purposes.
  - **Mitigation:** Come up with a solution to maintain a constant line of communication between Twitter API and our local python ML model.
- **Insufficient data to train ML model**
  - **Description:** Insufficient training data for our ML model might lead to overfitting.
  - **Mitigation:** Data augmentation generates additional training data from existing examples.
- **ML model receiving garbage data from Twitter**
  - **Description:** Twitter users will quite often post about their travel experience with United airlines and post a picture along with it. However, most of the time, these pictures will neither include the interior nor the exterior of their travel aircraft.
  - **Mitigation:** Create a data filtering method. Even another ML model might be utilized to filter out bad data.
- **Multiple aircraft in one photo**
  - **Description:** Having multiple aircraft within the same frame might need to be clarified for the ML model. The likelihood of obtaining such data will be the greatest from Twitter.
  - **Mitigation:** Limit images to photos with 1 aircraft. For this, another ML model might be utilized to filter out bad data.

Schedule

Week 1 – (1/9 – 1/15)
- Initial meeting with team members
- Designate roles into key areas
- Initial client meeting
- Initial triage meeting with TM Griffin Klevering

Week 2 – (1/16 – 1/22)
- Status Report Presentation
- Research vital technologies

Week 3 – (1/23 – 1/29)
- Initialize database
- Extract pictures from twitter
- Start ML model data preprocessing
- Consolidate initial model architecture for Paint quality scoring (decide NN layers to use)
- Consolidate initial model architecture for Interior/Exterior classification

Week 4 – (1/30 – 2/5)
- Create table for pictures from twitter
- Extract pictures from gmail
- Finish a static Dashboard page for twitter
- Train and Test version 1 of the model for paint quality scoring
- Build model for Interior/Exterior classification
- Project Plan Presentation

Week 5 – (2/6 – 2/12)
- Test saving pictures into database
- Connect with Twitter API call from backend to display picture and caption real-time
- Evaluate version 1 of the paint quality scoring model and produce possible improvements
- Train and test model for interior/exterior classification

Week 6 – (2/13 – 2/19)
- saving pictures extracted from twitter and gamil into database
- Finish a static Dashboard page for Uploads
- Start integrating the initial version of the paint quality scoring model into the webapp (Note this is our risk, so we should be done with this by alpha)

Week 7 – (2/20 – 2/26)
- Finish a static Upload page
- Model fine-tuning: Paint Scoring and Interior/Exterior models
- Alpha Presentation

Week 8 – (2/27 – 3/5)
- Consolidate front-end and back-end
- Finish a static Summary page
- Model fine-tuning: Test with new data sets

Schedule

Week 9 – (3/6 – 3/12)
- Create table for scores related to aircraft components
- Model fine-tuning: Try to improve accuracy and performance of the model
- Connect Summary page to database

Week 10 – (3/13 – 3/19)
- Model fine-tuning: test the model with low quality/non-ideal images
- Connect Dashboard page for Employees to database

Week 11 – (3/20 – 3/26)
- Model fine-tuning: test model with low quality/non-ideal images
- Implement Edit page and Save updates to database
- Status Report Presentation

Week 12 – (3/27 – 4/2)
- Model fine-tuning: final testing and improvements
- Finish a static Search Result page
- Test extracting pictures from database and use model to score them

Week 13 – (4/3 – 4/9)
- Beta Presentation
- Connect Search Result page to database

Week 14 – (4/10 – 4/16)
- Create table for users
- Create Sign In and Sign-Up pages. Connect to database.
- Make Project Video

Week 15 – (4/17 – 4/23)
- Finish documentation and prepare for delivery
- Create a Dashboard page for Gmail and connect to database (stretched goal)
- Status Report Presentation

Week 16 – (4/24 – 4/30)
- Make sure Front-end, Back-end, and Machine Learning are fully integrated
- Present final deliverables to client
- Project Video
- Design Day

Week 17 – (5/1 – 5/5)
- Capstone Wrap Up

Questions?