#### **MICHIGAN STATE** UNIVERSITY **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** Spring 2023

From Students...

## **United Airlines Overview**

- "Connecting People. Uniting the World"
- Major American airlines headquartered 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

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## Screen Mockup: Edit Window

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## Screen Mockup: Upload Page



# Screen Mockup: Summary Page



# Screen Mockup: Search Result Page

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### **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/nonideal 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?**



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