**accuracy inspections etc.**
Airbus Aerial is a commercial drone startup under Airbus which leverages on existing aerospace technology to provide imagery services across applications such as insurance, agriculture, building inspections etc.

**Project Overview**
As such, drones are increasingly deployed to speed up inspection processes. Machine Learning is used to process image data, to standardise defect identification process.

**Key Objectives**
To evaluate the usage of CNN machine learning models in facade defects inspection

**Skillsets Applied**
Statistical data analysis
Machine Learning using Python programming

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### Data Collection
- **Scraping**
  - To build database
- **Slicing**
  - To increase images in database
- **Rotation**
  - To increase robustness of training data set

**Base CNN Architecture**
Input layer is customized to take in images in dimensions 224*224*3, which represents width, height and depth

**Accuracy Analysis**
Overall Accuracy (%)

![Accuracy Analysis Diagram]

Type II error is another metric that should be considered when deciding the best combination

**Further Improvements**
**MobileNetV2**
Using depth wise separable convolutions which replace traditional convolutions - reduce computation and parameters.

**Model with Transfer Learning**
Where pre-trained weights from Imagenet is used
Hence model does not have to learn from scratch

Accuracy: 38.7% to 63%
Type II error: 11.8% to 65.8%
Earlier layers are untrainable, which are crucial for defect detection

**Model w/o Transfer Learning**
Best performing accuracy of 94.6% with 0% Type II error
Hyperparameter combination of 150 EP, 16 BS and 0.0001 LR

**Hyperparameter Optimization**
Varying 3 different hyperparameters for 5 chosen intervals to find out the combination that leads to the highest accuracy amidst 125 configurations

**Benchmarking**
Chaiasam et al.  Our Base CNN Archi.
Inspect heritage buildings  2 classes  Test accuracy 67.5%
Cha et al.  Our Base CNN Archi.
Trained with 3,000 images  2 classes  Test accuracy 97%

**Limitations**
Limited capability of CPU - Unable to run 128, 256 BS on MobileNetV2
Lack of representative data for all classes - Limited to 1000 images per class
Long training time required for MobileNetV2

**Future Direction & Conclusion**
Use actual image data captured by Airbus drones
Identify multiple defects in a single image
Overall accuracy and Type II errors should be considered as performance indicators for hyperparameter optimization
MobileNetV2 is preferred with its higher overall accuracy