“ Ships From Space?

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Problem Motivation

Security: Maritime Surveillance, Search and Rescue Operations

Environment: Environmental Monitoring, Humanitarian Efforts

Global Trade: Commerce and Supply Chain Analysis

Dataset

- San Francisco Bay or San Pedro Bay
- 4000 80x80 RGB images
- Labels
  - 1: Ship
  - 2: No-Ship

San Pedro Bay

San Francisco Bay

Dataset

1: Ship

0: No Ship

Solution and Approach

Noise → **Median Blur**

Cloud Cover, Time of Day, Rotation → Image Augmentation

Edge Detection, Scale Invariance → CNN instead of Random Forest

Original

Median Blur (Window Size = 3)

Solution and Approach

Noise → Median Blur

Cloud Cover, Time of Day, Rotation → **Image Augmentation**

Edge Detection, Scale Invariance → CNN instead of Random Forest

Original


Augmented


Solution and Approach

Noise → Median Blur

Cloud Cover, Time of Day, Rotation → Image Augmentation

Scale invariance and edge detection → **CNN instead of Random Forest**

Class 1


Class 0


Experiments

Baseline: Random Forest

CNN for Edge Detection

CNN Architecture V1

Major Shift in Architecture

CNN Architecture V2

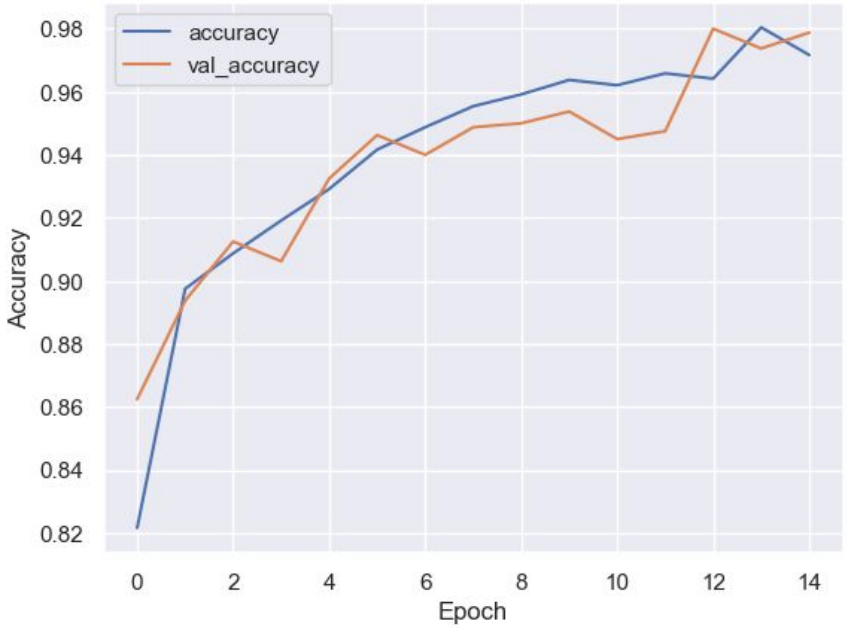
Hyperparameter Tuning

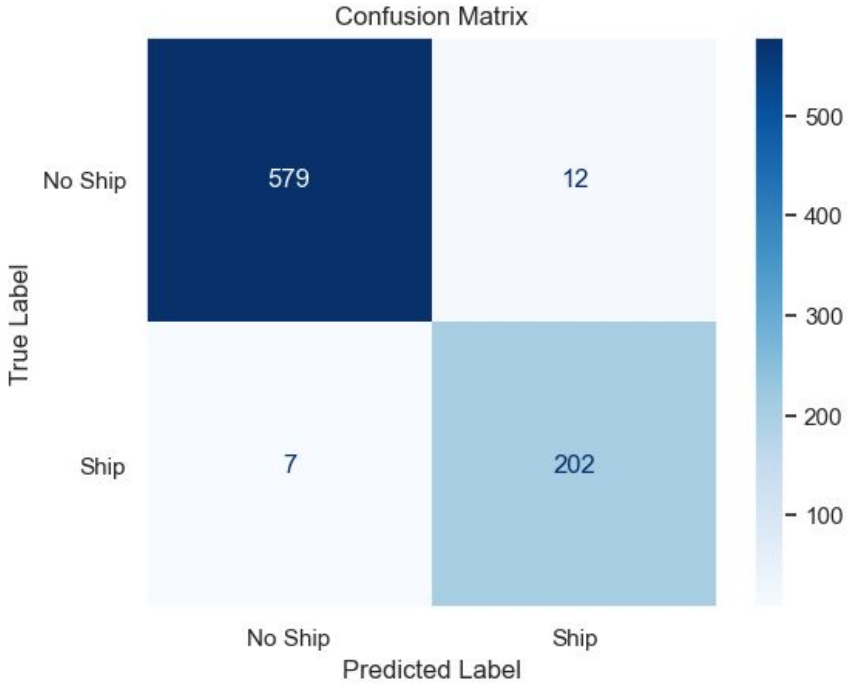
Final CNN

Layer (type)	Output Shape	Param #
conv_1 (Conv2D)	(None, 80, 80, 32)	2,432
pool_1 (MaxPooling2D)	(None, 40, 40, 32)	0
conv_2 (Conv2D)	(None, 40, 40, 64)	18,496
pool_2 (MaxPooling2D)	(None, 20, 20, 64)	0
flatten_3 (Flatten)	(None, 25600)	0
fc_1 (Dense)	(None, 512)	13,107,712
dropout_3 (Dropout)	(None, 512)	0
fc_2 (Dense)	(None, 1)	513

Total params: 13,129,153 (50.08 MB)
Trainable params: 13,129,153 (50.08 MB)
Non-trainable params: 0 (0.00 B)

Results and Conclusion





Ethical, Legal, and Personal Concerns

Privacy: Surveillance, Data Security

Algorithmic Bias: Biased Data Leads to Biased Results

Limitations: Geospatial Generalizability

NeurIPS Checklist

- For all authors...
  - Do the main claims made in the abstract and introduction accurately reflect the paper's contributions and scope? **yes**
  - Have you read the ethics review guidelines and ensured that your paper conforms to them? **yes**
  - Did you discuss any potential negative societal impacts of your work? **yes**
  - Did you describe the limitations of your work? **yes**
- If you are including theoretical results...
  - Did you state the full set of assumptions of all theoretical results? **n/a**
  - Did you include complete proofs of all theoretical results? **n/a**
- If you ran experiments...
  - Did you include the code, data, and instructions needed to reproduce the main experimental results (either in the supplemental material or as a URL)? **yes**
  - Did you specify all the training details (e.g., data splits, hyperparameters, how they were chosen)? **yes**
  - Did you report error bars (e.g., with respect to the random seed after running experiments multiple times)? **yes**
  - Did you include the amount of compute and the type of resources used (e.g., type of GPUs, internal cluster, or cloud provider)? **yes**
- If you are using existing assets (e.g., code, data, models) or curating/releasing new assets...
  - If your work uses existing assets, did you cite the creators? **yes**
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  - Did you discuss whether and how consent was obtained from people whose data you're using/curating? **yes**
  - Did you discuss whether the data you are using/curating contains personally identifiable information or offensive content? **yes**
- If you used crowdsourcing or conducted research with human subjects...
  - Did you include the full text of instructions given to participants and screenshots, if applicable? **n/a**
  - Did you describe any potential participant risks, with links to Institutional Review Board (IRB) approvals, if applicable? **n/a**
  - Did you include the estimated hourly wage paid to participants and the total amount spent on participant compensation? **n/a**

Works Cited

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Contributions

Alice: Problem Motivation, Ethical/Legal/Personal Concerns, NeurIPS Checklist, Reviewing Code, Initial Powerpoint Draft, Initial Report Draft of All Sections

Eliot: Trained a random forest baseline model and CNN. Experimented with three different learning rates (0.001, 0.0001, 0.00001) and the Adam optimization function. Trained the final model using 10 epochs

Eric: Dataset, Results & Conclusion, Model Architecture, Model Evaluation

Kenneth: EDA, Identified Experiments to Test, Implemented Experiments Image Preprocessing & Augmentation Experiments, Evaluated Model Performance

Thank You