Early Detection of Military Aircraft

Testing custom ConvNeXt classifier on artificially degraded images

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1. **Introduction**
2. Dataset
3. Model
4. Results
5. Conclusion

The goal of the project was to explore and determine the limits of a ConvNeXt image classifier as a **visual early warning system** for military aircraft.

Idea: images with degraded properties could simulate real-time images taken from **far away** and/or in **suboptimal conditions**.

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F-14

F-4

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ConvNeXt

- "Modernized"[1] ResNet CNN
- Developed to keep up with ViTs
- Maintains simplicity, efficiency, and inductive biases of CNN architecture

[1] https://arxiv.org/pdf/2201.03545

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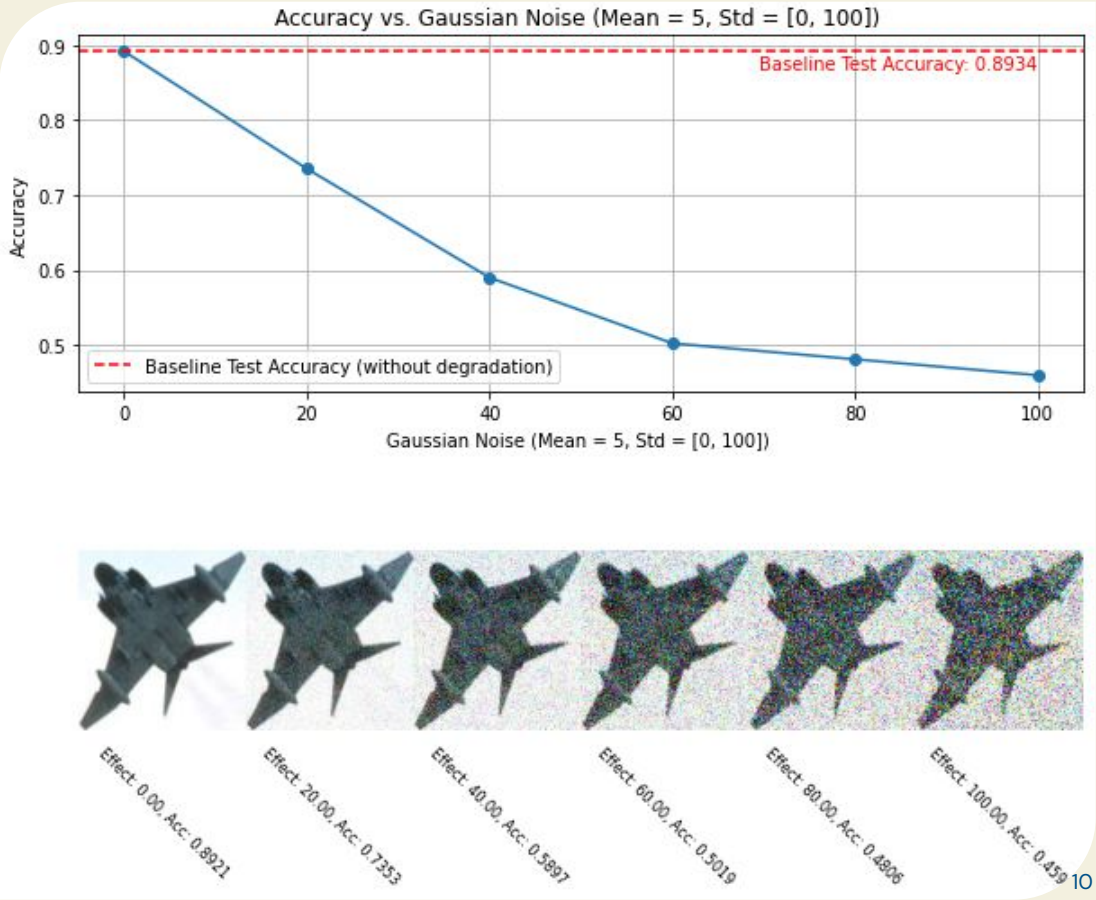
Class	Precision	Recall	F1-score	Support
F14	0.86	0.88	0.87	330
F4	0.92	0.90	0.91	467
accuracy			0.89	797
macro avg	0.89	0.89	0.89	797
weighted avg	0.89	0.89	0.89	797

Gaussian Noise

Intended effect: introduce random noise

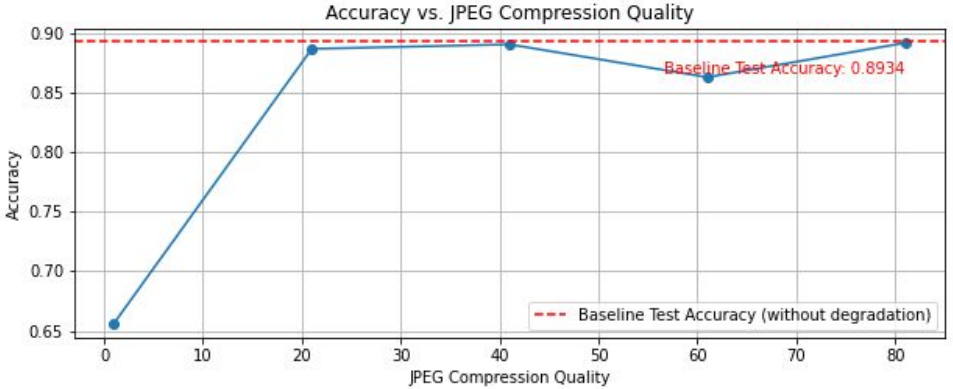
Effect parameter: mean (5), std (0–100, step=20)

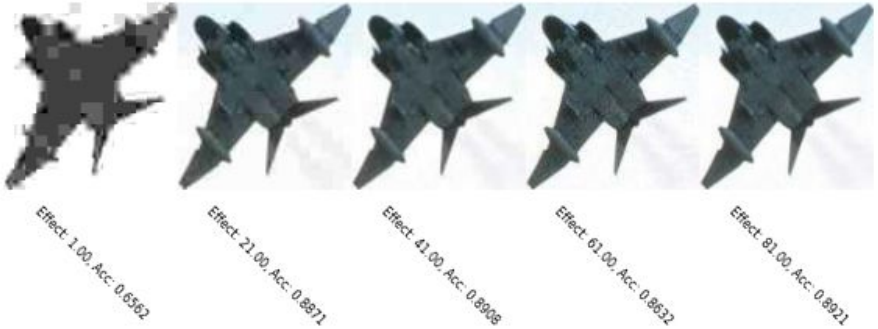


JPEG Compression Quality

Intended effect: introduce JPEG artifacting

Effect parameter: image quality (1–81%)

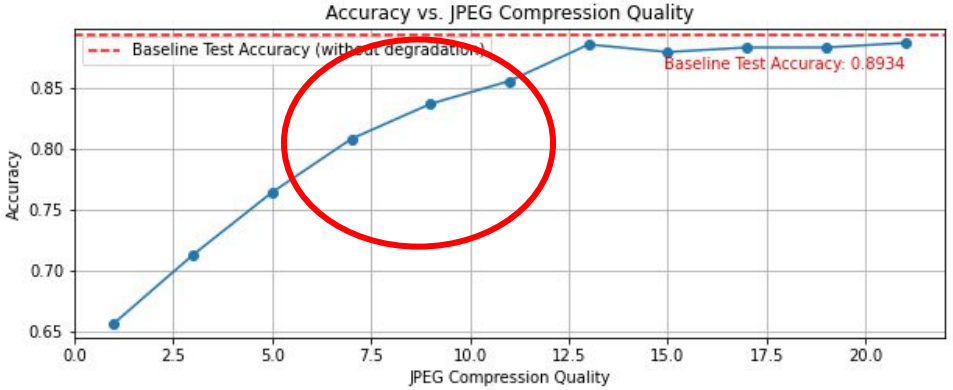


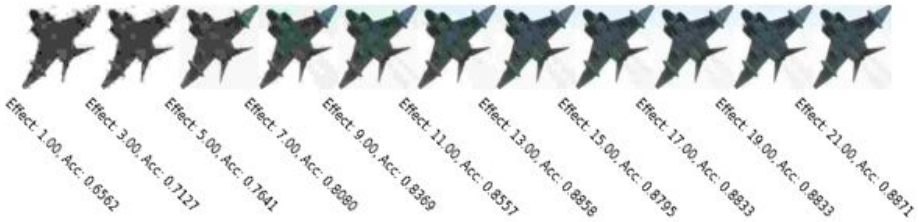


JPEG Compression Quality

Intended effect: introduce JPEG artifacting

Effect parameter: image quality (1–21%)





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Drawing a Conclusion

- Degraded pictures → **harder prediction**
- Most surprised
  - For better - JPEG compression
  - For worse - Gaussian noise
- Would have liked to see better baseline
  - Given more time
    - Better H-param. tuning
    - Try diff arch.