Capstone FAQs – AI & Drone Applications

Capstone A: Crop Health Monitoring Using Multispectral Imagery

Why do NDVI-related features appear higher in importance than other indices?

Vegetation indices summarize multiple spectral relationships, which can make them capture variation more compactly than individual bands.

If my accuracy is high, why should I still check ROC-AUC?

Accuracy reflects performance at one decision threshold, while ROC-AUC evaluates ranking quality across thresholds.

Why do some stressed regions look isolated in the heatmap?

Heatmaps reflect local tile-level predictions, which may highlight small stressed pockets even when global metrics look stable.

Should correlated vegetation indices be removed before training?

Correlation alone does not imply redundancy; some correlated features still improve robustness.

Why does standardization have limited effect on vegetation indices?

Many indices are ratios by design, which already reduces scale sensitivity.

Why does class imbalance affect recall more than precision?

Minority class representation influences how aggressively the model learns rare patterns.

Why does the confusion matrix look asymmetric?

Borderline stress cases tend to cluster near decision boundaries.

Is feature importance enough to explain model behavior?

Feature importance shows influence but not interaction effects.

Why does spatial visualization appear noisier than metrics?

Metrics average performance, while spatial plots preserve local variability.

Why are multiple evaluation metrics required?

Each metric highlights different failure modes.

Capstone B: Thermal Powerline / Tower Hotspot Detection

Why do temperature-based features dominate importance plots?

They directly capture sustained thermal behavior emphasized in the dataset.

Why is ROC-AUC emphasized over accuracy?

Hotspot detection is more about ranking risk than binary correctness.

Why does adding noise reduce accuracy but increase realism?

Real sensors exhibit variability that idealized data lacks.

Why are neighboring tiles relevant to interpretation?

Thermal behavior is spatially continuous.

Why do some coefficients have negative signs?

Sign reflects relative influence, not absolute physical absence.

Why do heatmaps appear smooth?

Tile aggregation blends local predictions.

Is missing small hotspots a major issue?

Resolution limits are inherent to tiling strategies.

Why apply scaling when units are meaningful?

Scaling improves numerical stability during training.

Why does performance vary across splits?

Label distribution and sample size introduce variance.

Why prioritize interpretability?

Feature importance is part of evaluation.

Capstone C: Forest Fire / Smoke Detection

Why is smoke harder to detect than fire?

Smoke overlaps visually with haze and clouds.

Why does precision drop at high recall?

More ambiguous regions are included.

Why use both color and texture features?

They capture complementary information.

Why does ROC-AUC differ from average precision?

Each summarizes performance differently under imbalance.

Why do false positives cluster spatially?

Similar features group geographically.

Why does noise affect feature rankings?

Noise redistributes explanatory power.

Why mention class imbalance explicitly?

It influences threshold behavior.

Why does normalization help convergence but not accuracy?

It stabilizes optimization.

Why isn’t temporal modeling implemented?

The capstone scope is single-frame analysis.

Why must thresholds be justified?

Thresholds shape the confusion matrix.

Capstone D: Landing Zone Safety Classification

Why do slope and roughness dominate importance?

They directly reflect landing constraints.

Why is accuracy lower here than other capstones?

Safety labels include ambiguous cases.

Why is ROC-AUC still acceptable?

Ranking safety confidence is stable.

Why do shadow features behave inconsistently?

Shadows affect perception, not always physical safety.

Why is NDVI relevant to landing zones?

Vegetation correlates with surface consistency.

Why distinguish false positives and negatives?

Each has different operational implications.

Why does smoothing improve maps?

Terrain safety varies gradually.

Why not require deep learning?

Features already encode domain knowledge.

Why don’t coefficients sum to one?

They represent relative influence.

Why include visual inspection in grading?

Metrics alone miss spatial patterns.

Capstone E: Traffic Congestion & Incident Detection

Why does average speed dominate importance?

Speed reflects congestion dynamics.

Why is ROC-AUC higher than accuracy?

Separation is good, thresholding causes errors.

Why normalize time of day?

It removes cyclical bias.

Why doesn’t density alone imply congestion?

Dense traffic can still flow smoothly.

Why does precision drop at extreme recall?

Ambiguous states are included.

Why does optical flow contribute less?

Aerial views reduce motion resolution.

Why are incidents scattered?

Incidents vary more than congestion.

Why is feature influence asymmetric?

Opposing traffic behaviors are modeled.

Why require spatial visualization?

Traffic events are spatial.

Why discourage perfect metrics?

Overlap and noise are realistic.