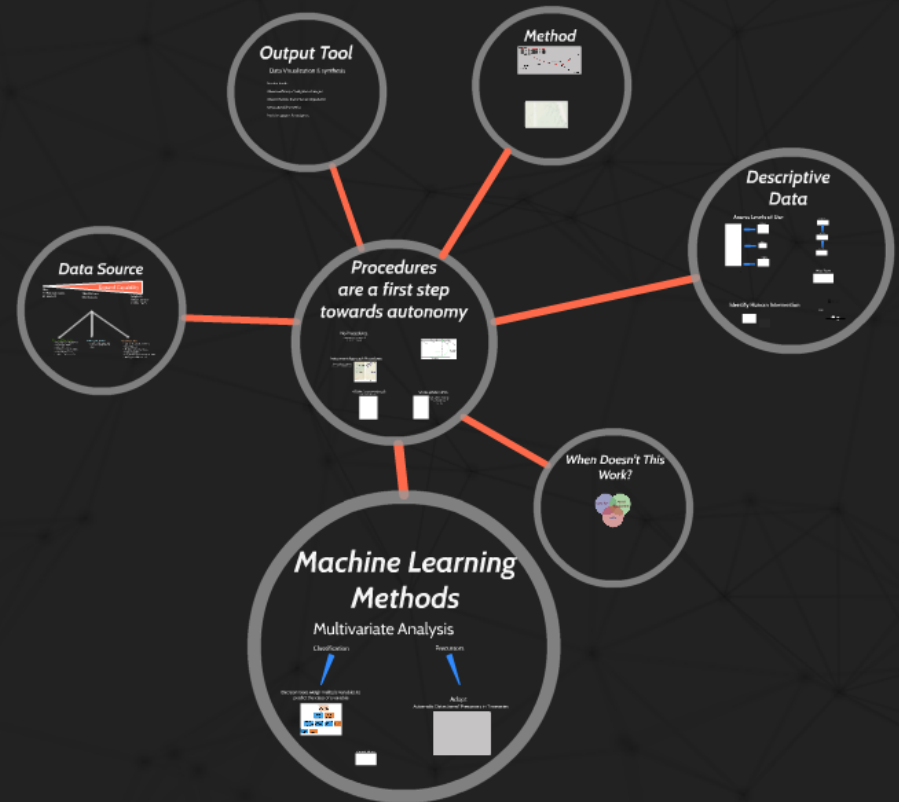
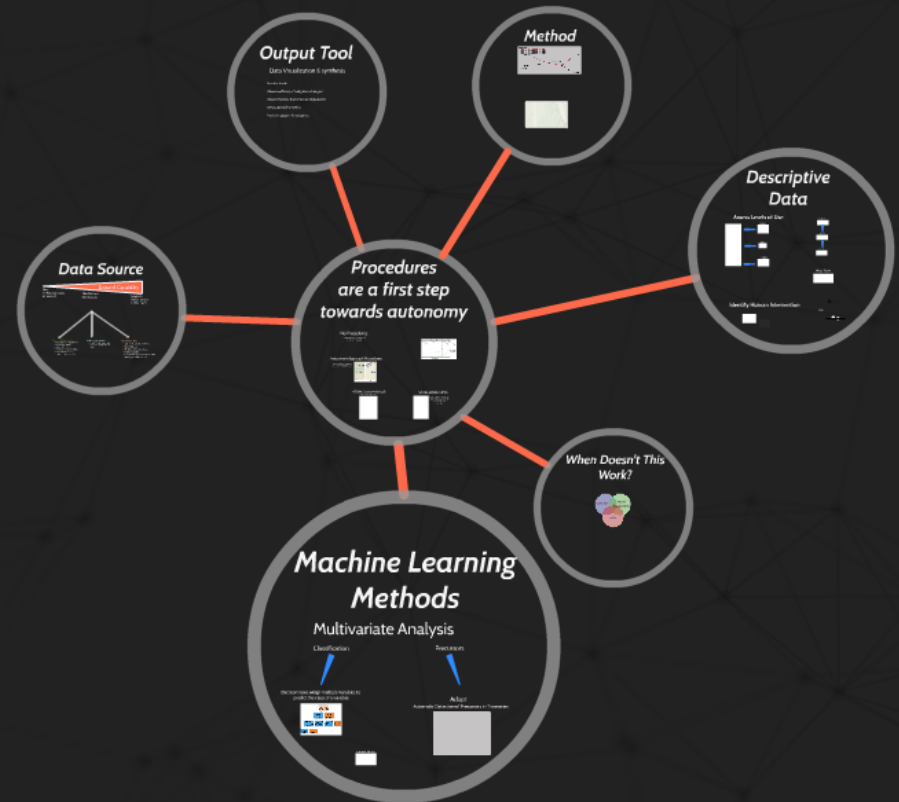


RNAV STAR Procedural Adherence



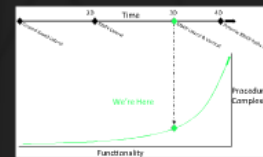
RNAV STAR Procedural Adherence



Procedures are a first step towards autonomy

No Procedures

Flying was dangerous and
not standardized



Instrument Approach Procedures

A method to consistently
guarantee terrain clearance



STARs (conventional)



STARs (RNAV OPD)



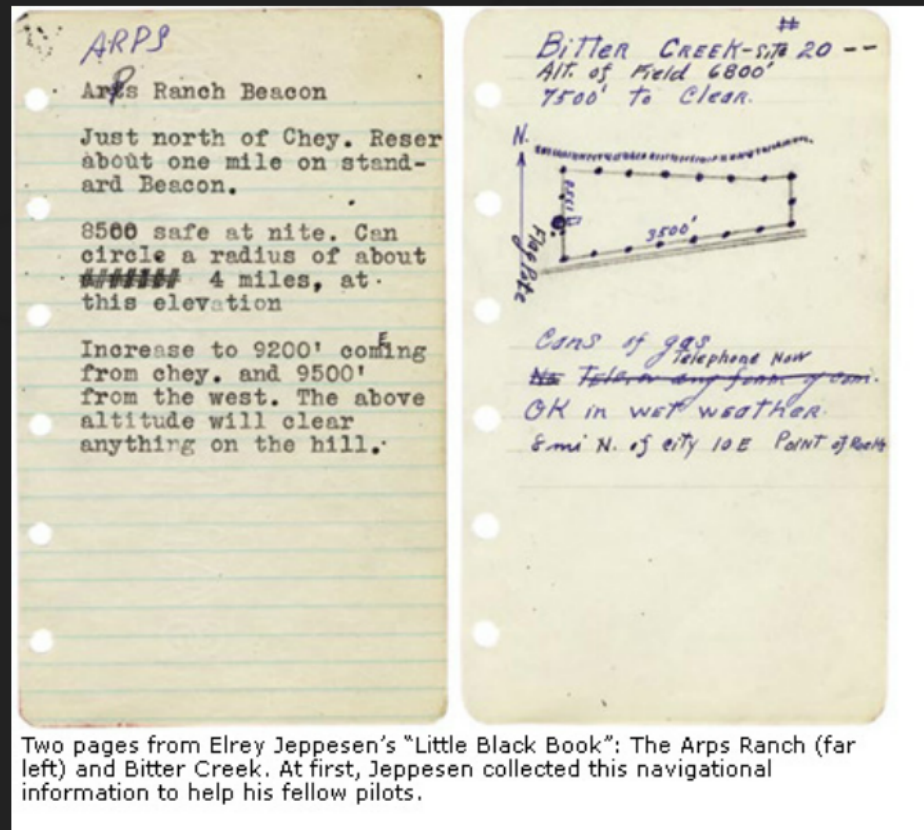
Noise reduction, fuel savings,
route standardization, and
flow management.
(FAA, 2014)

No Procedures

Flying was dangerous and
not standardized

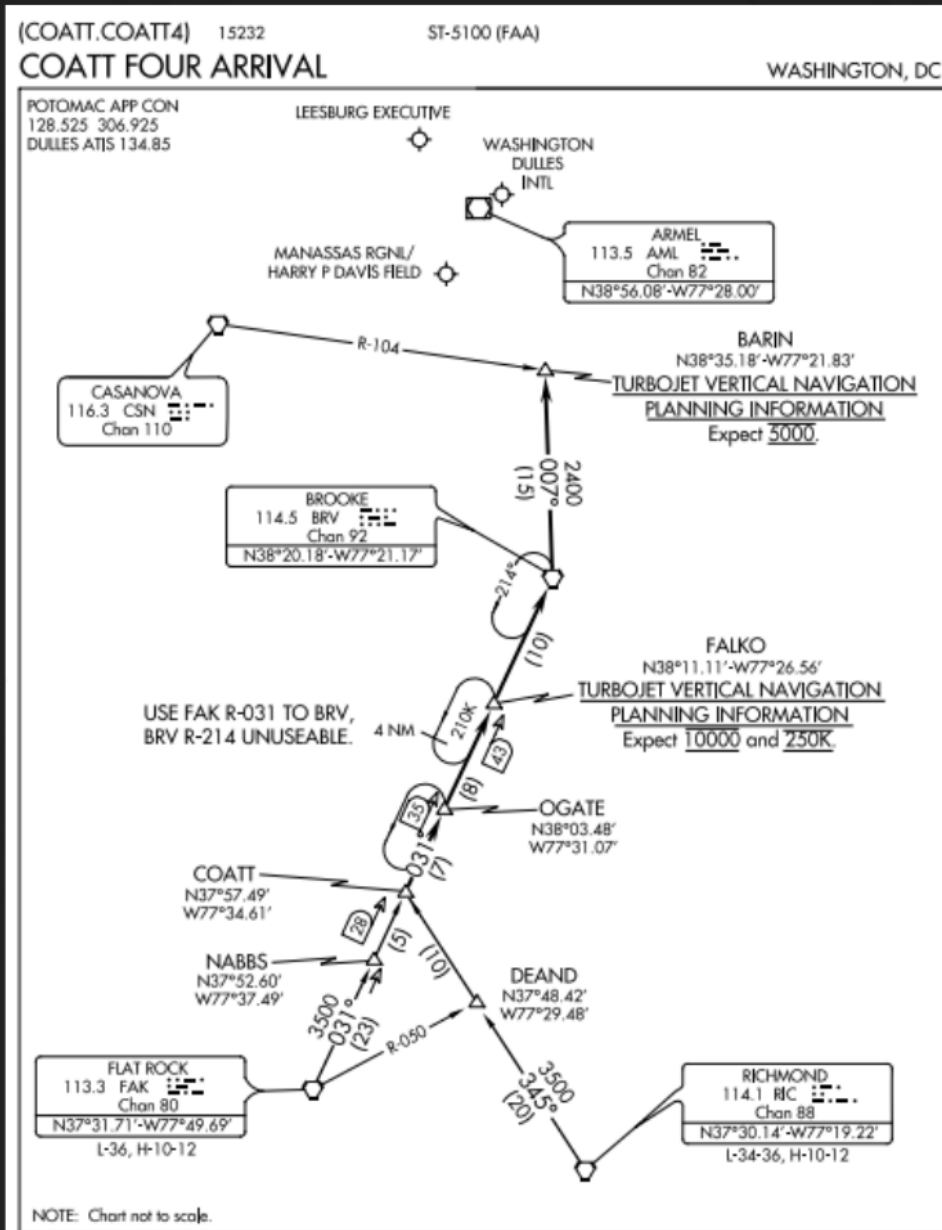
Instrument Approach Procedures

A method to consistently guarantee terrain clearance



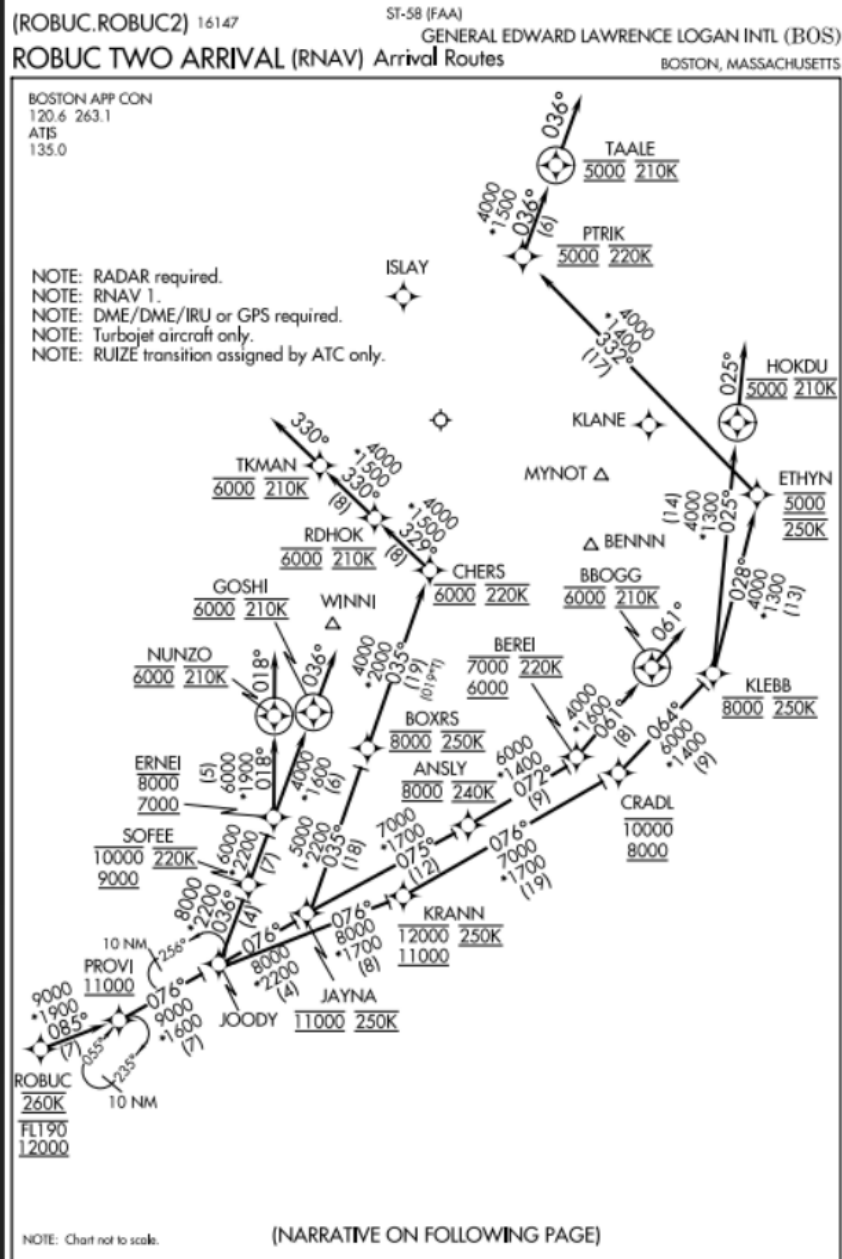
STARs (conventional)

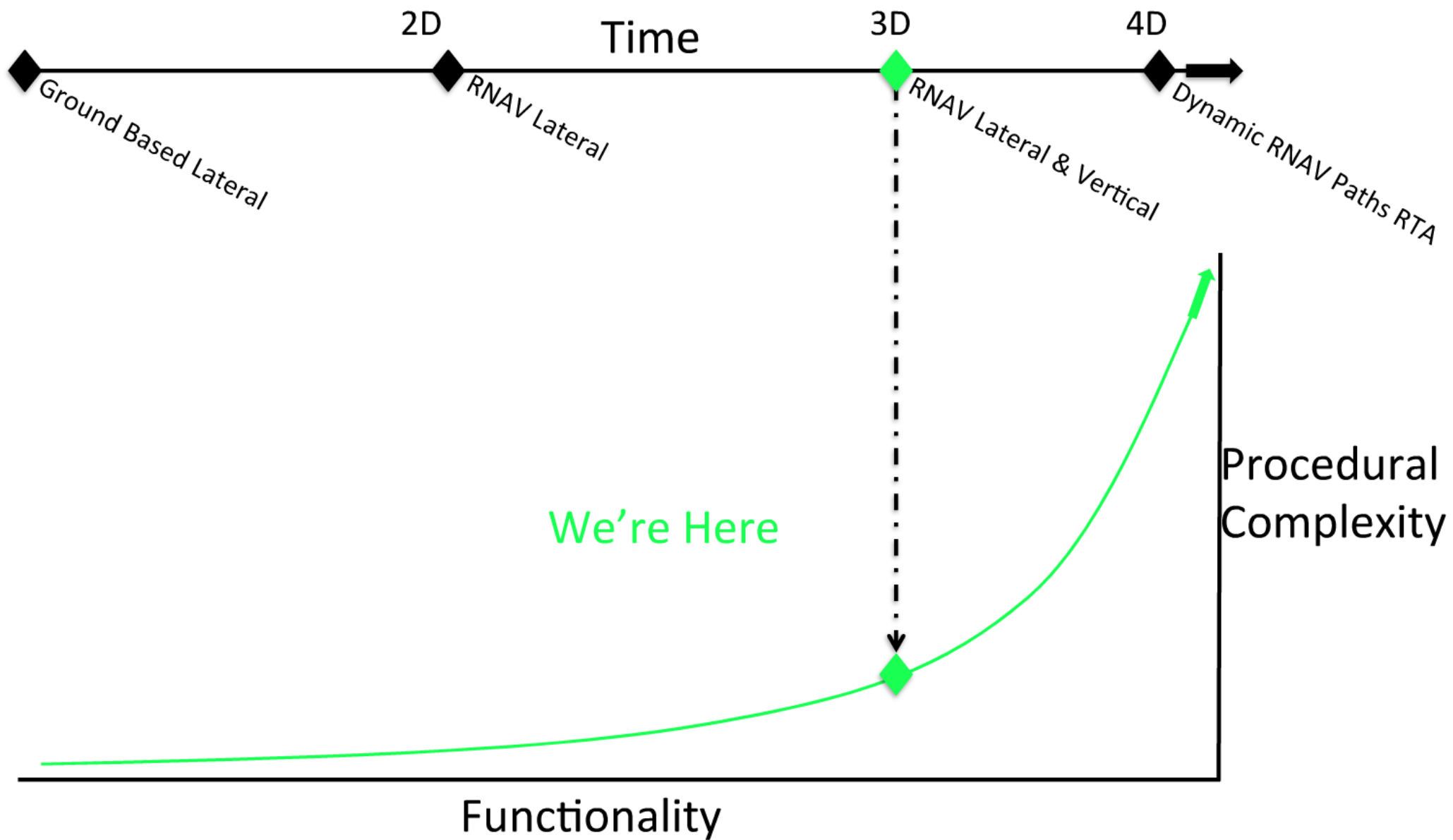
Standardized Routing & Terrain Clearance



STARs (RNAV OPD)

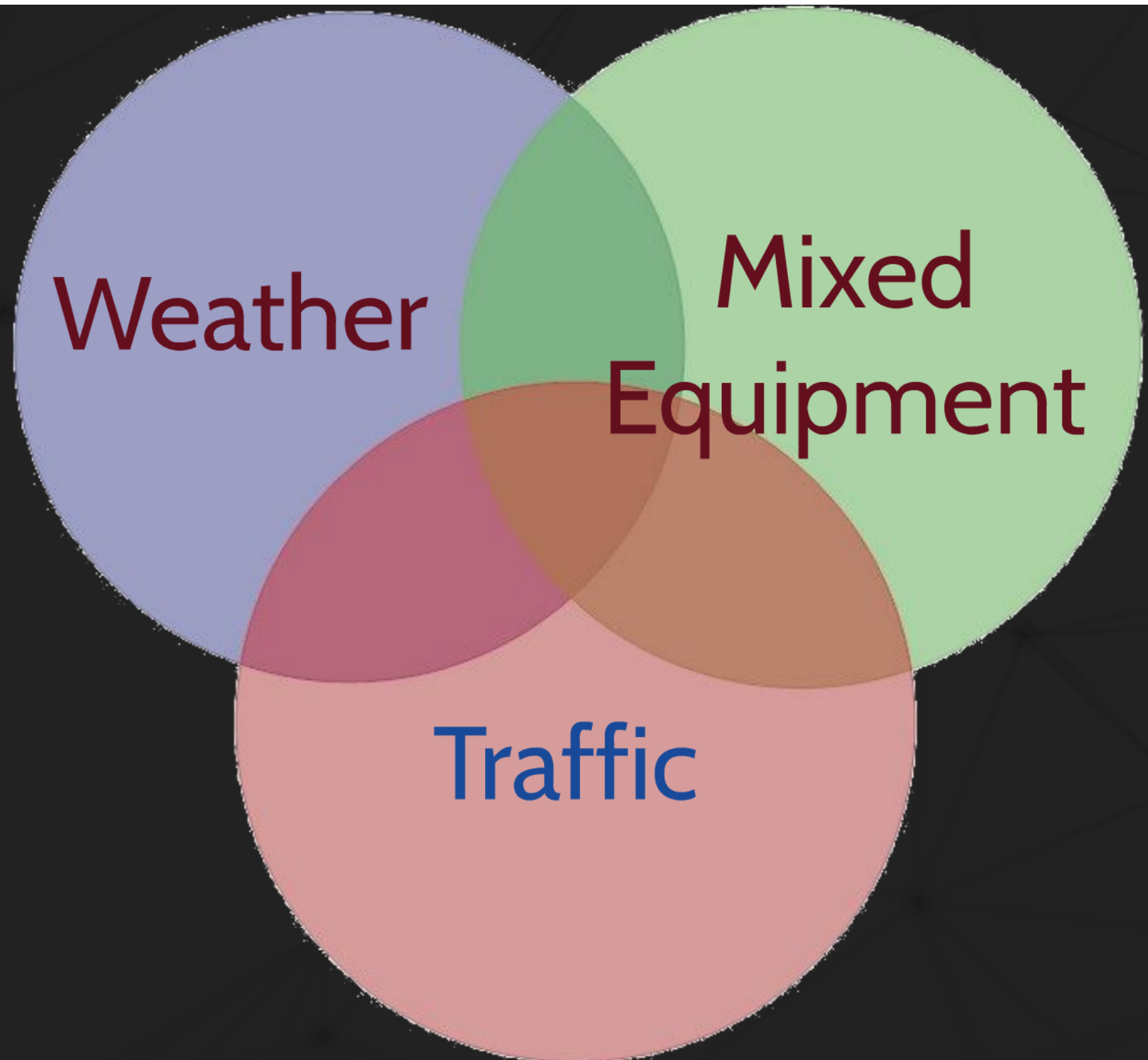
Noise reduction, fuel savings,
route standardization, and
flow management.
(FAA, 2014)



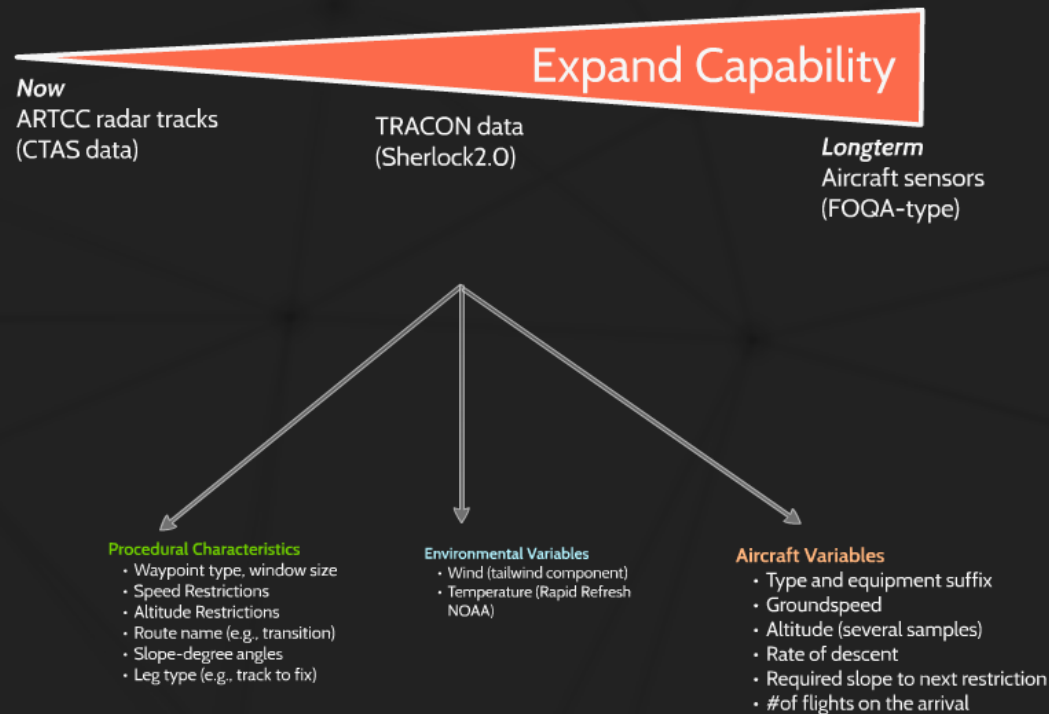


When Doesn't This Work?





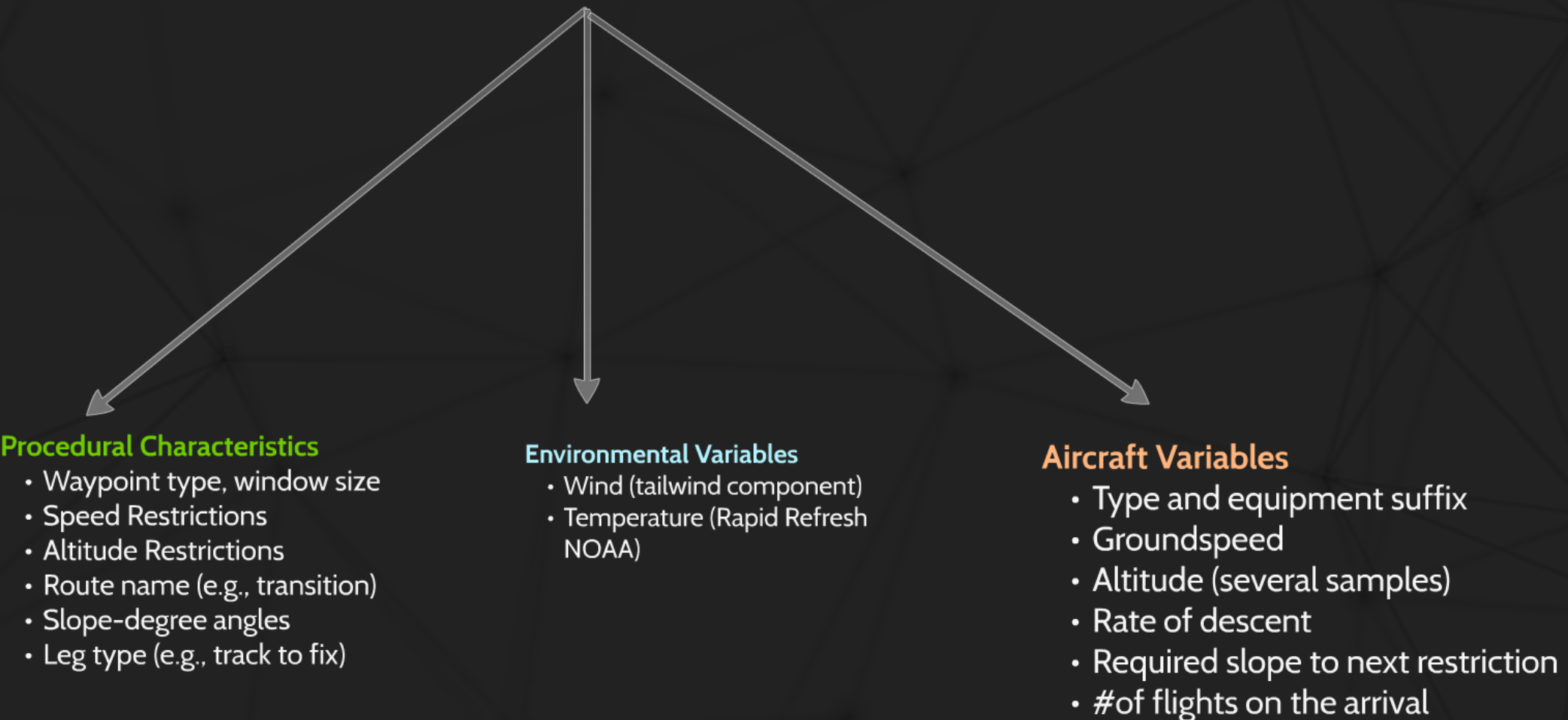
Data Source



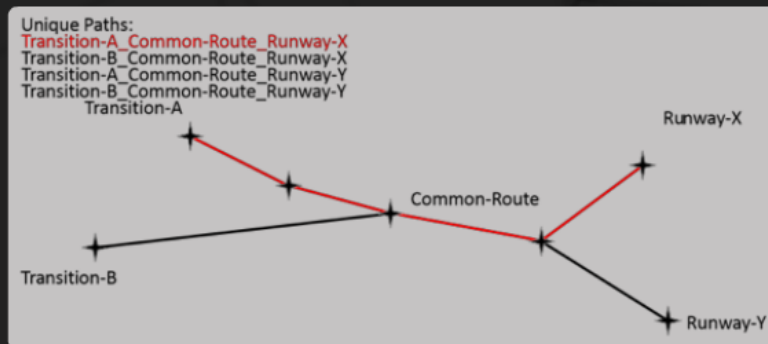
ata)

(Sherlock2.0)

Longterm
Aircraft sensors
(FOQA-type)



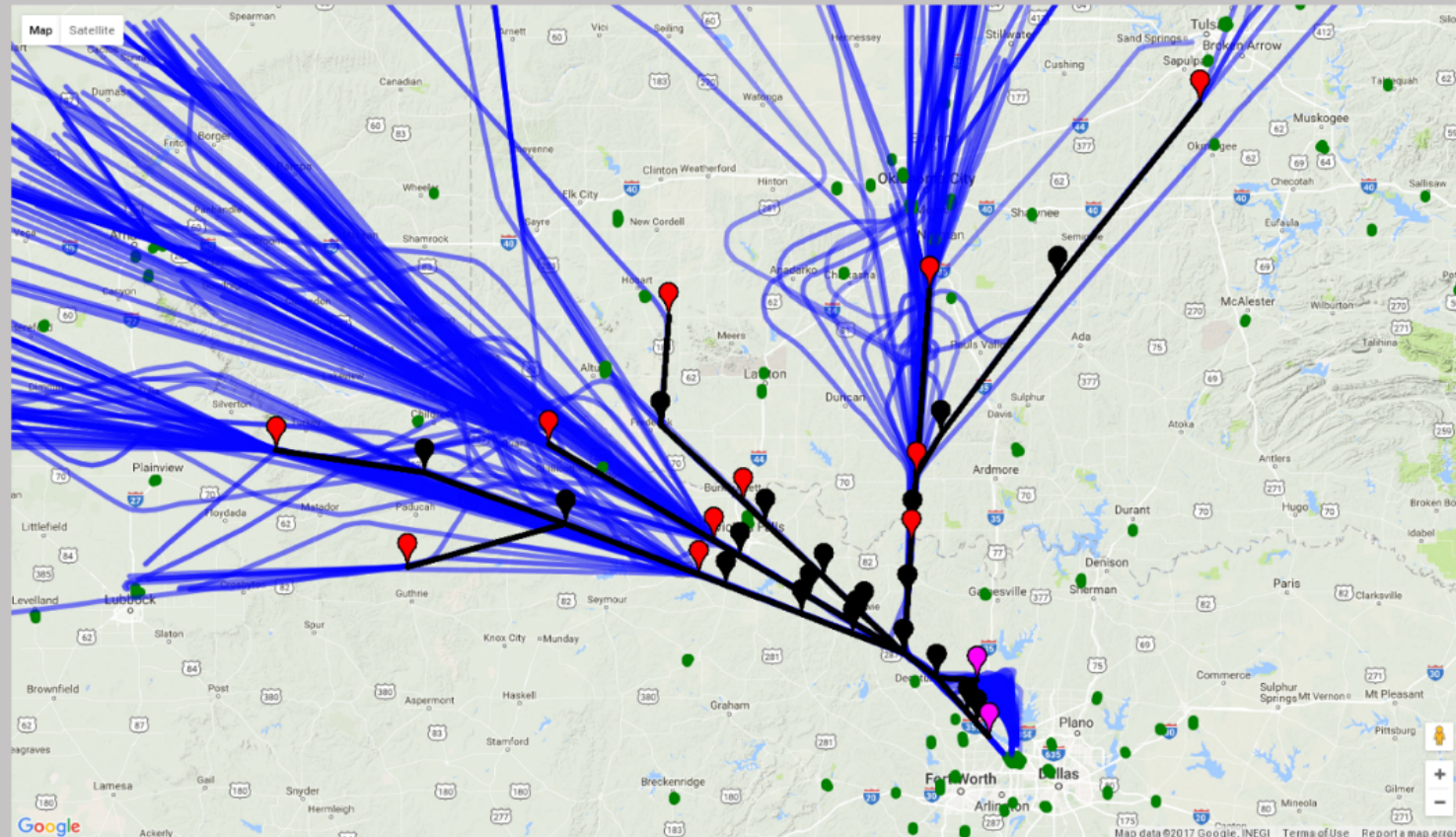
Method



Overlay Flights on Routes

- Entry Waypoint
- Waypoint in route
- Exit Waypoint

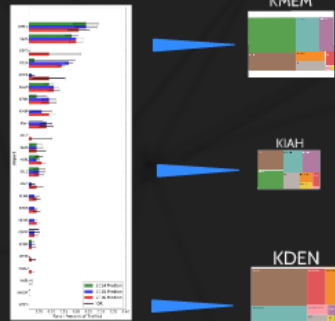
- Identify route flown
- Determine adherence of lateral flight trajectory with waypoint restrictions
- Characterize lateral adherence (join late/skip/ early exit)



Full Lateral Adherence of VKTRY2 into KDFW

Descriptive Data

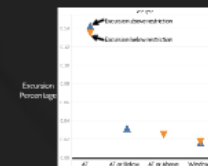
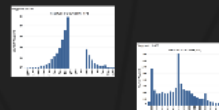
Assess Levels of Use



Miles Flown

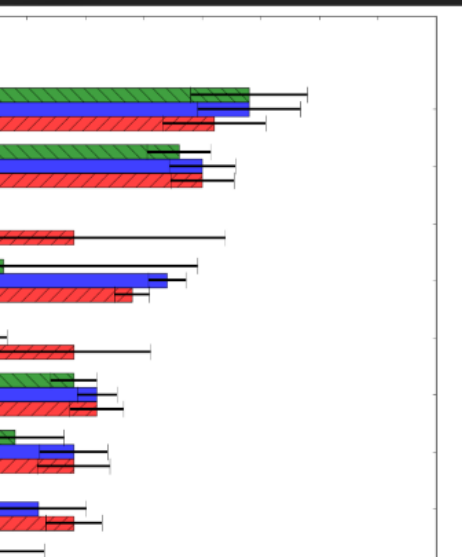


Identify Human Intervention

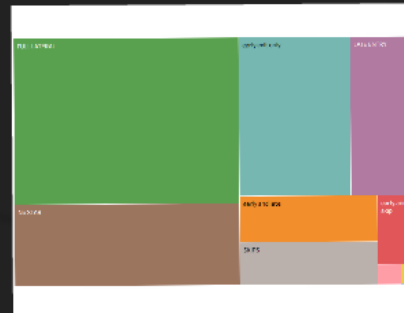


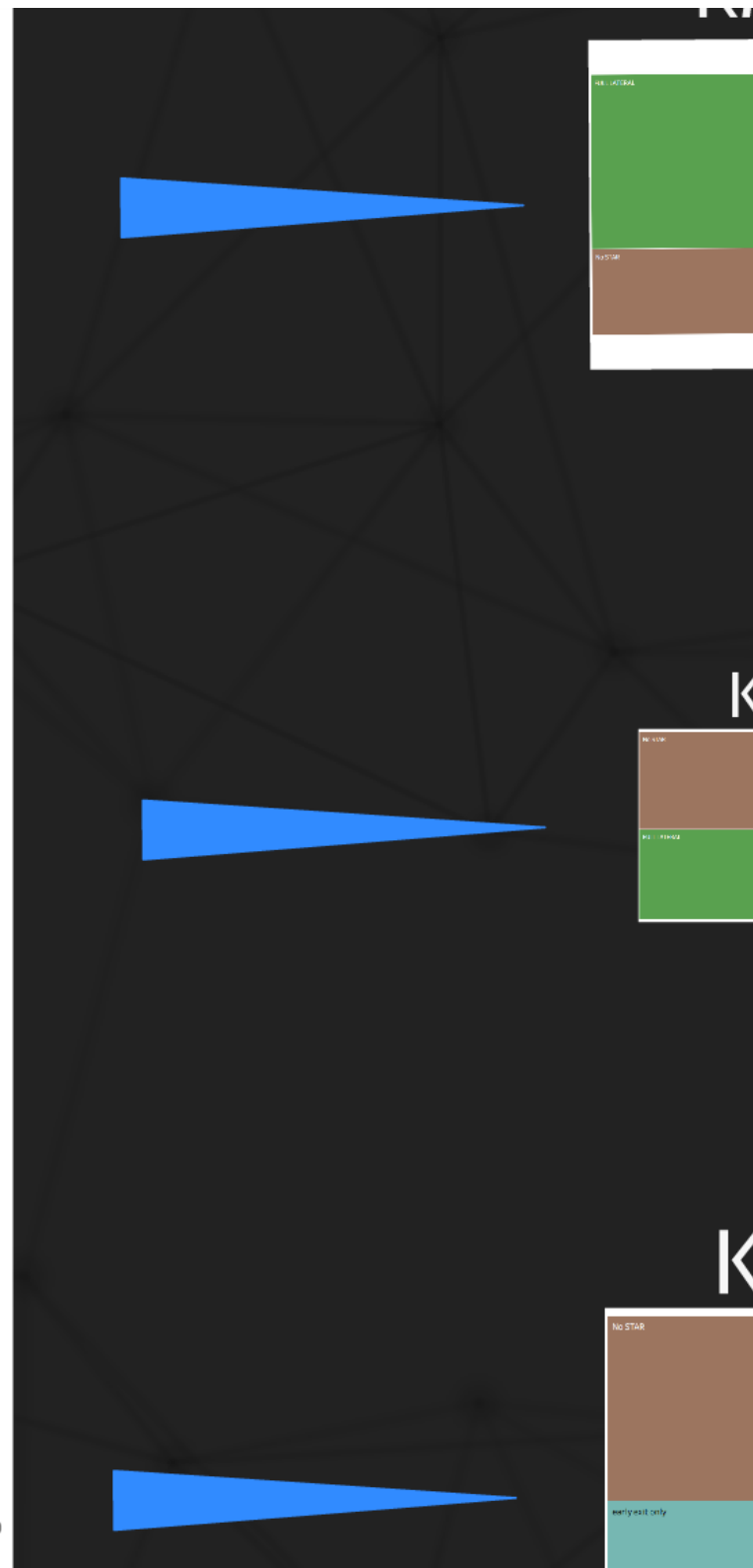
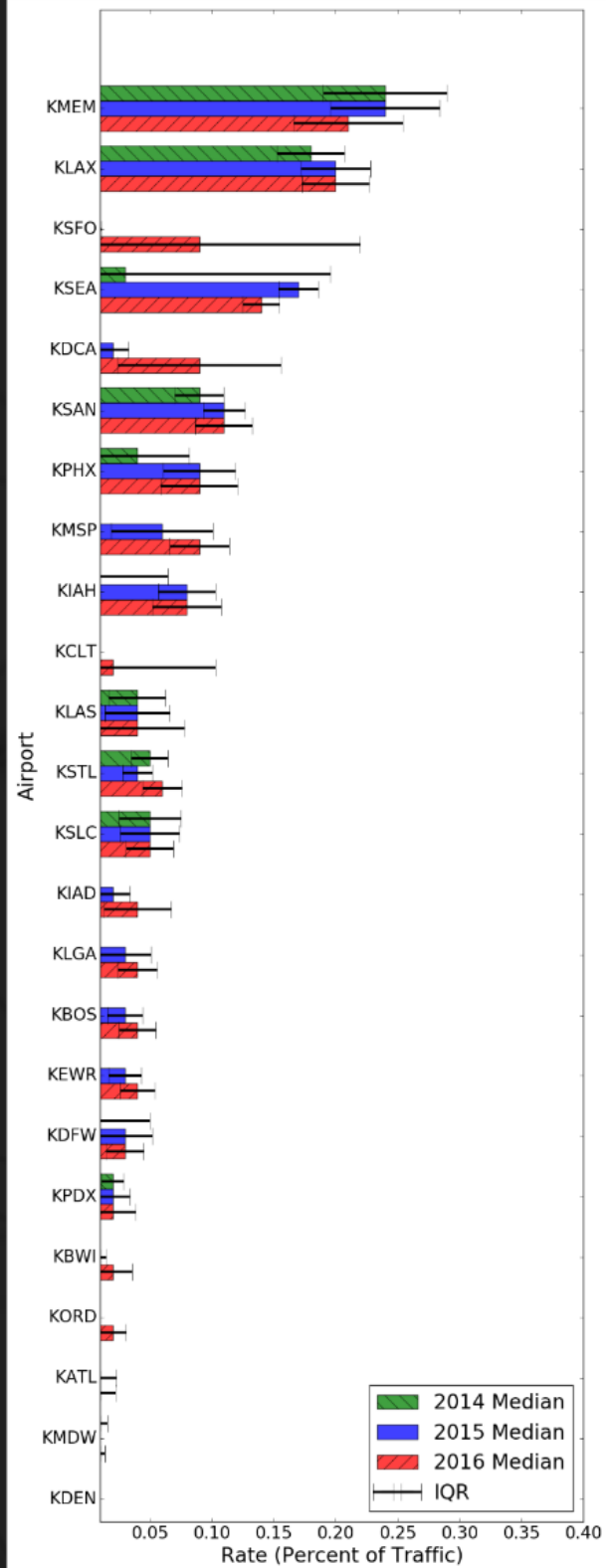
Da

Assess Levels of Use

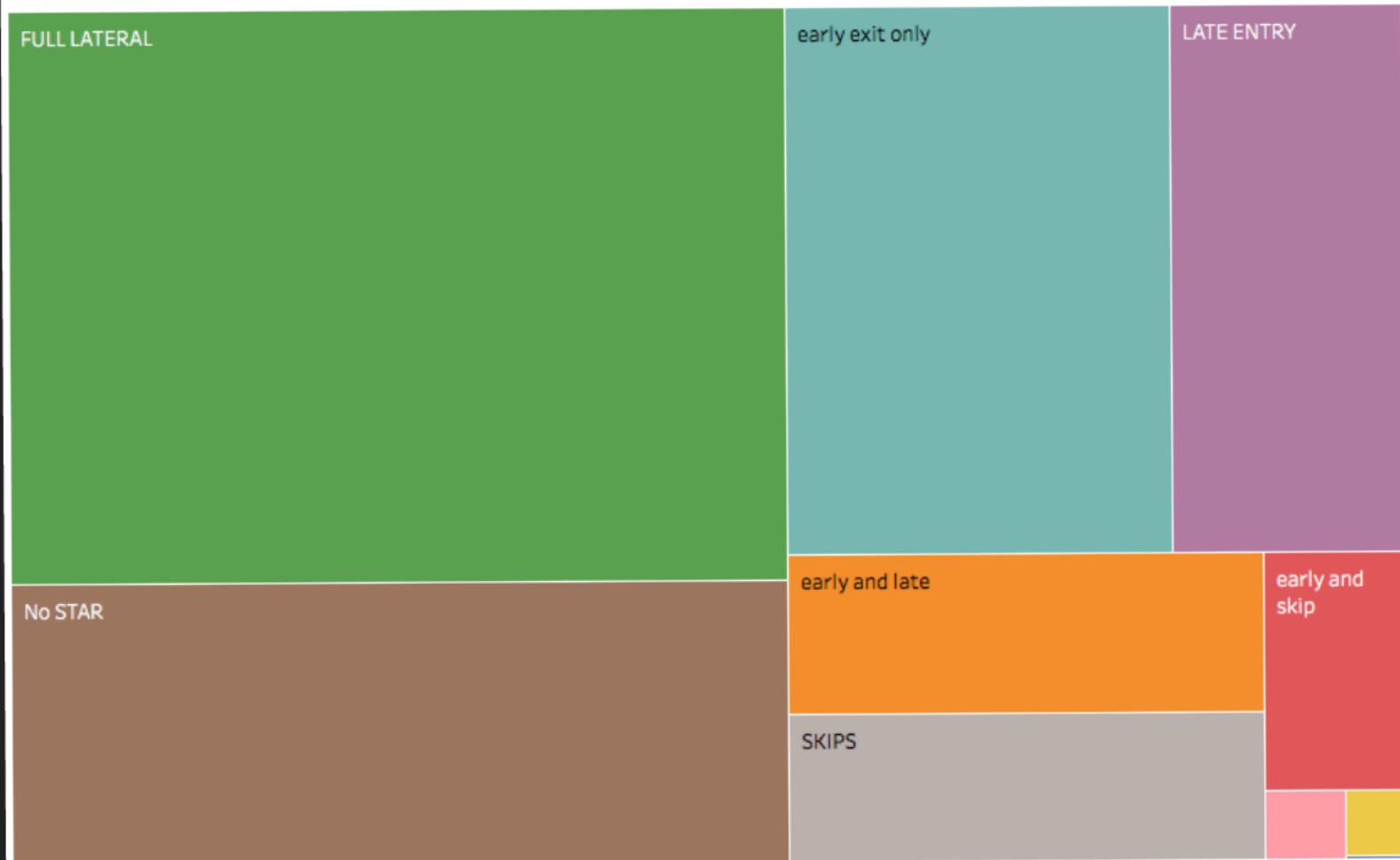


KMEM

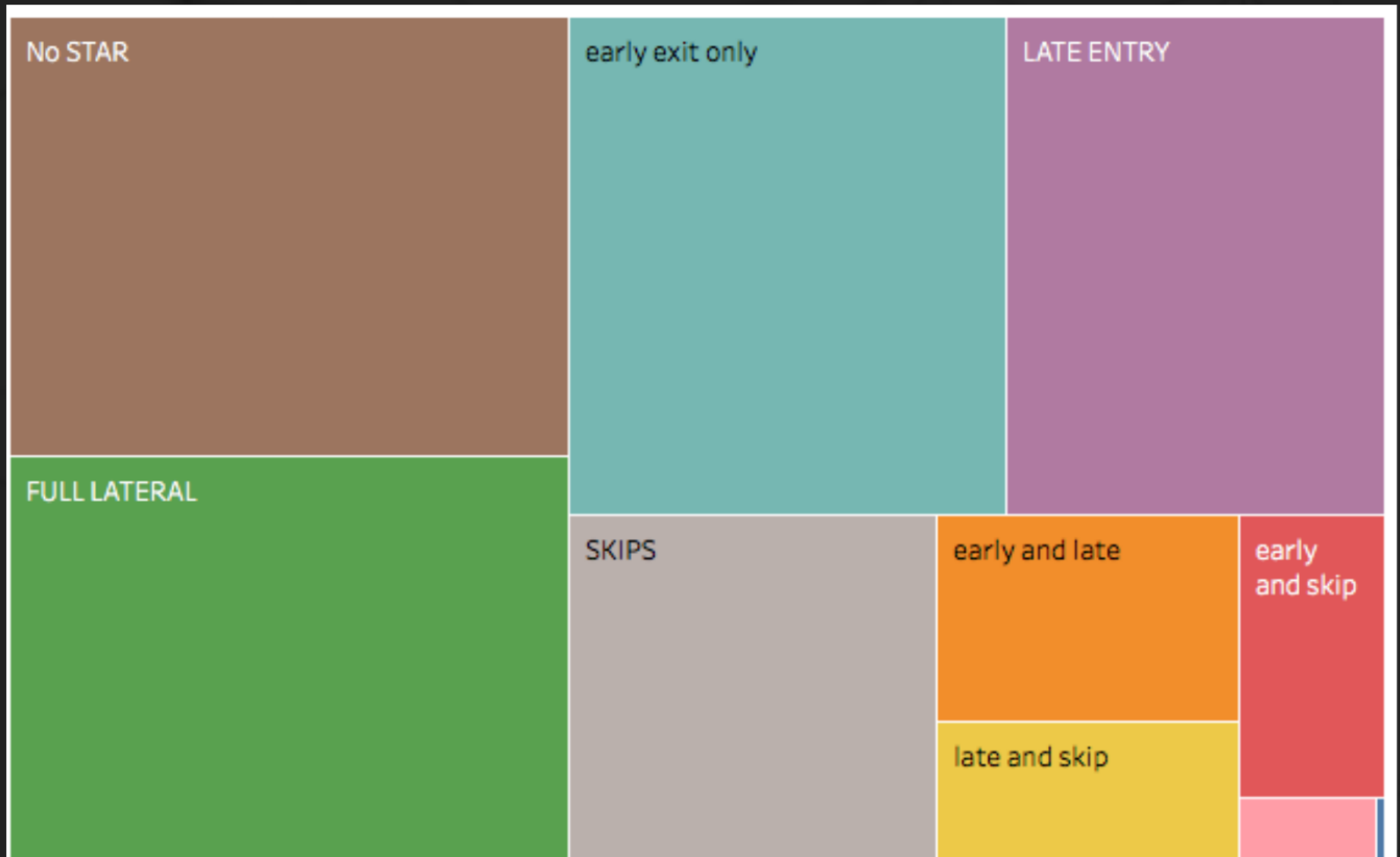




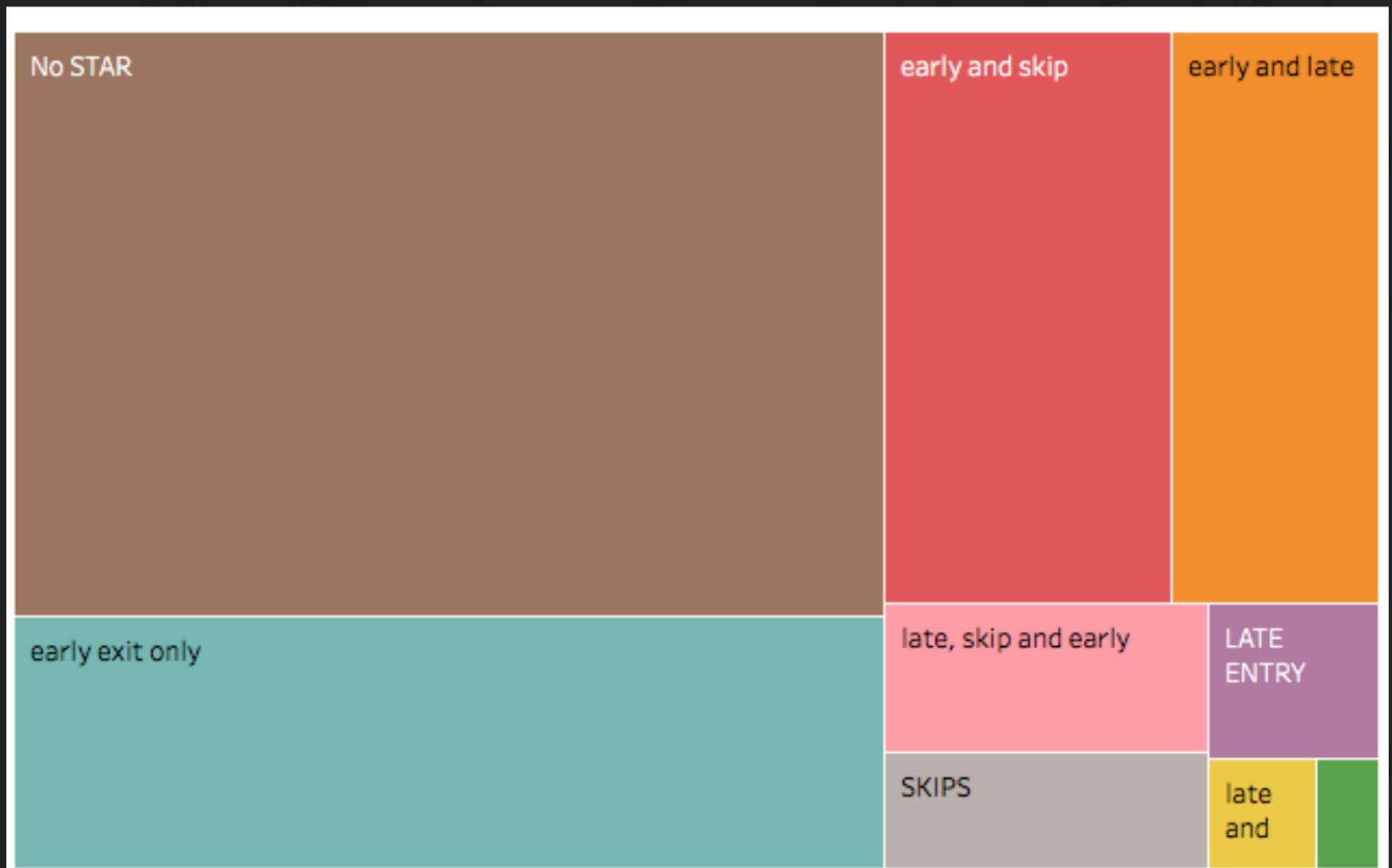
KMEM



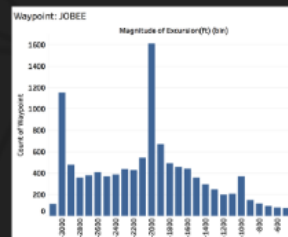
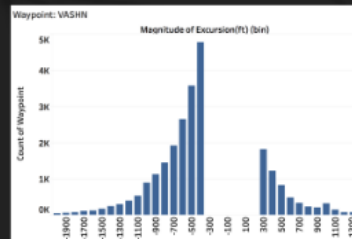
KIAH



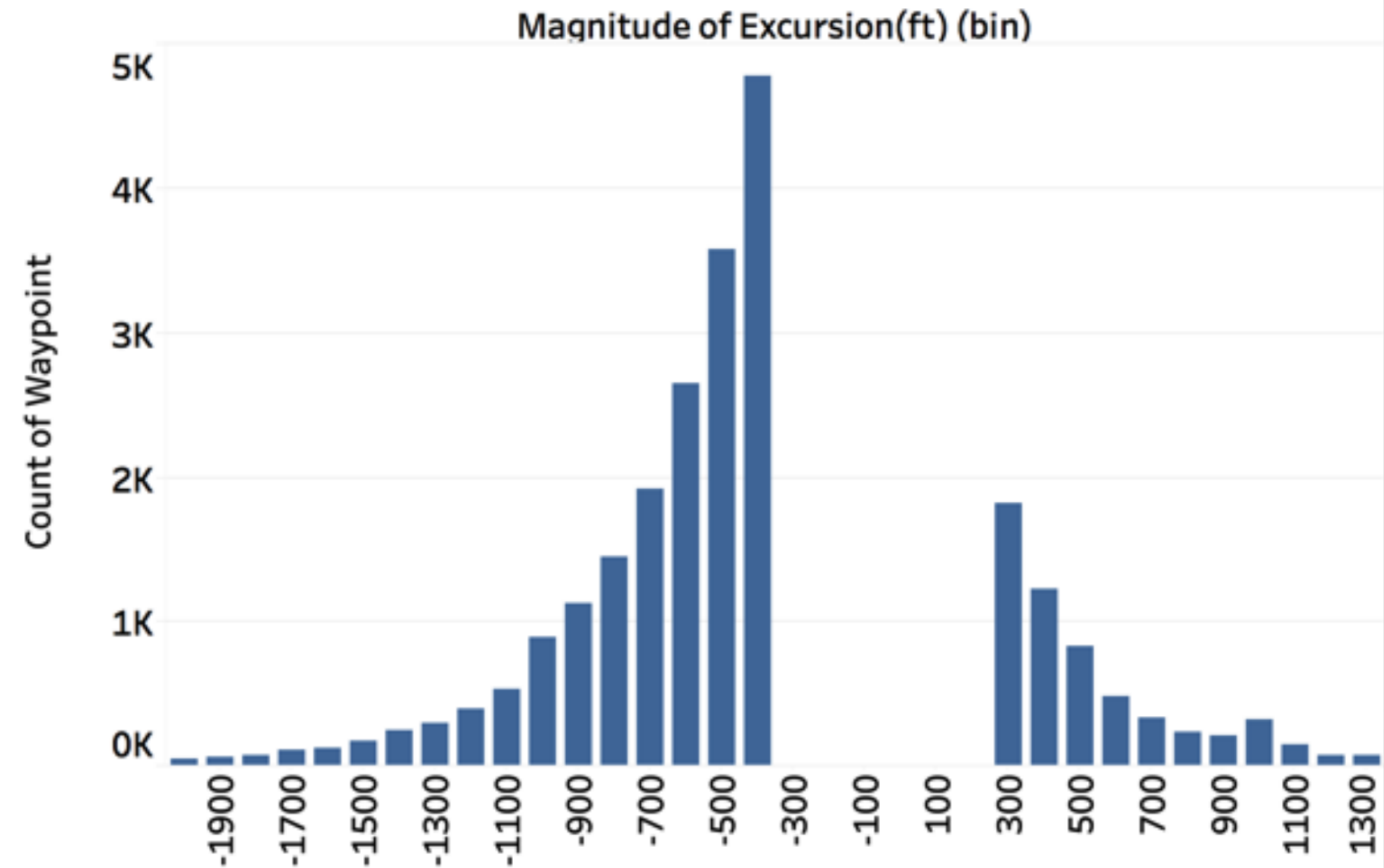
KDEN



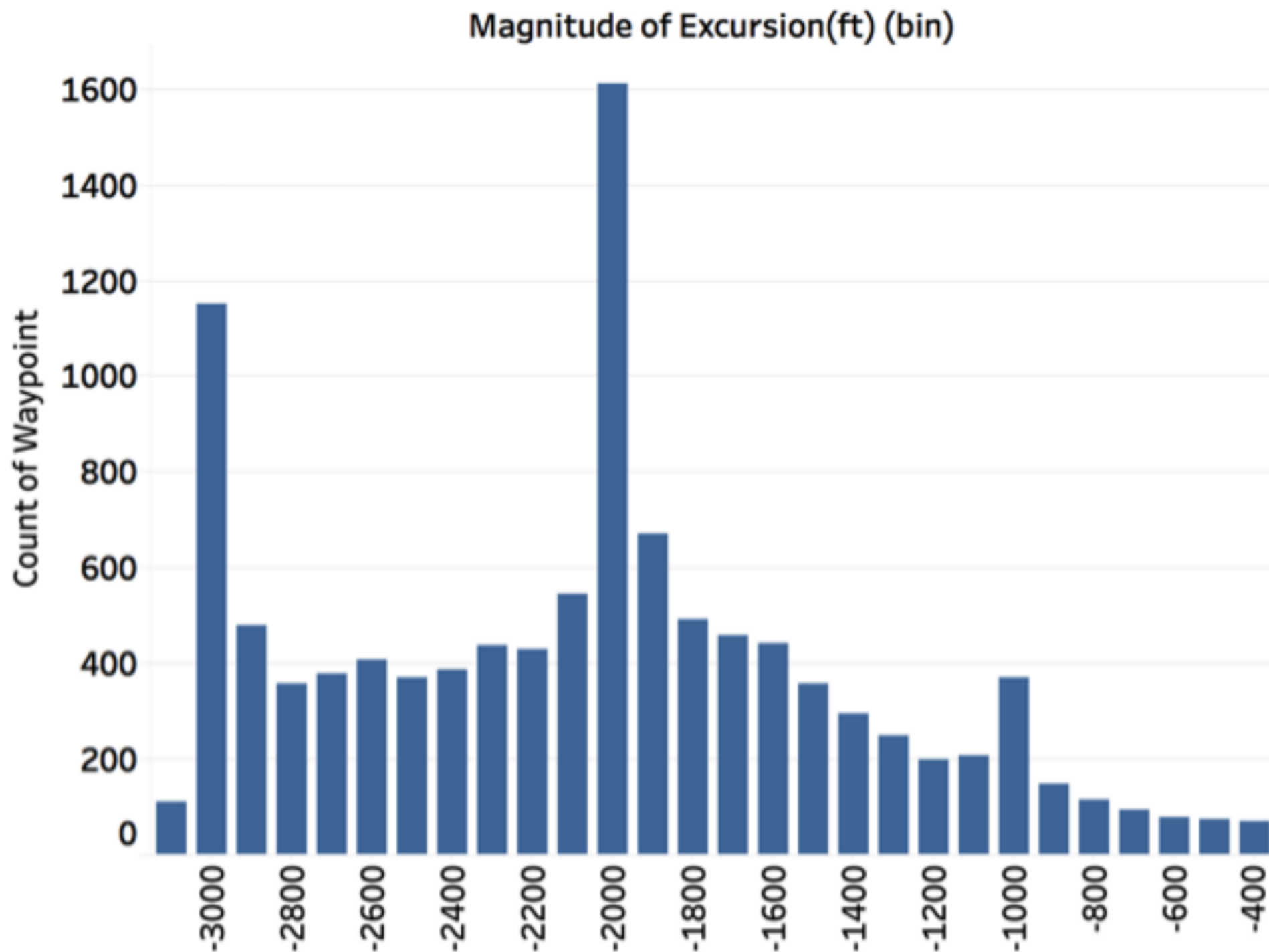
Identify Human Intervention



Waypoint: VASHN

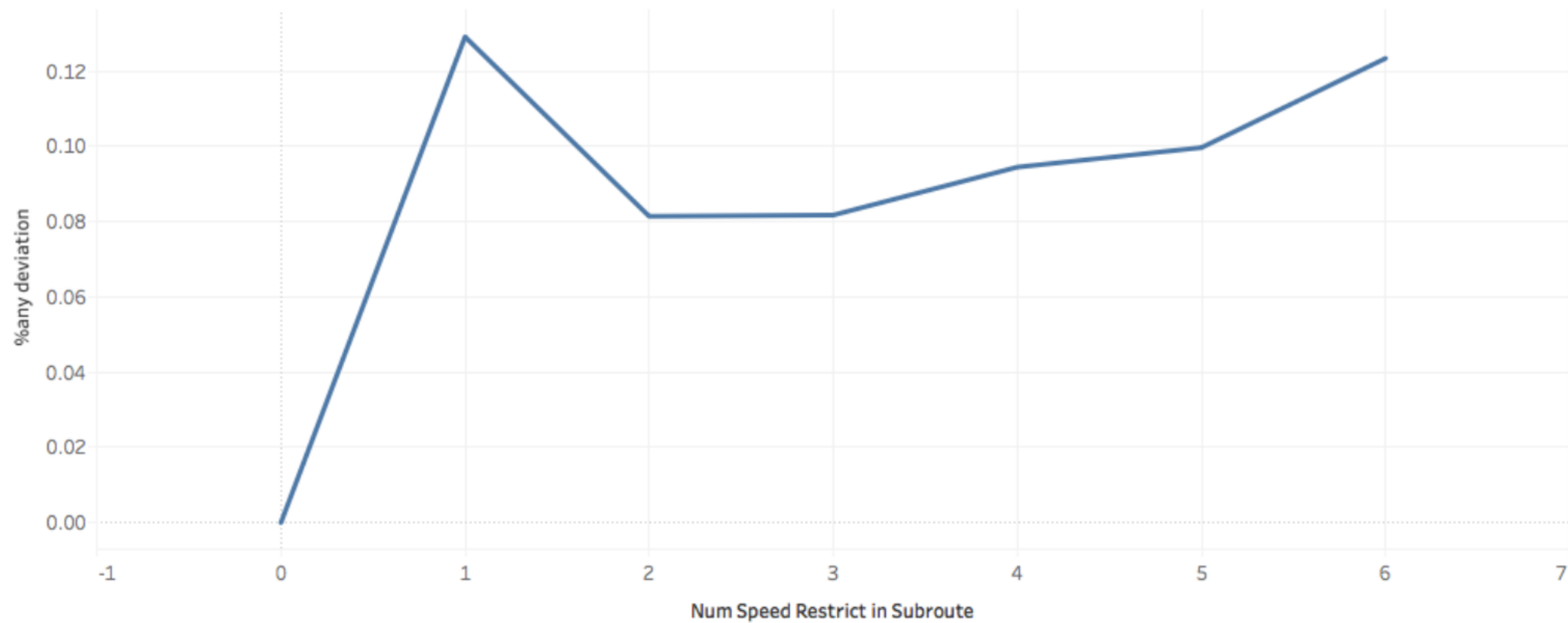


Waypoint: JOBEE



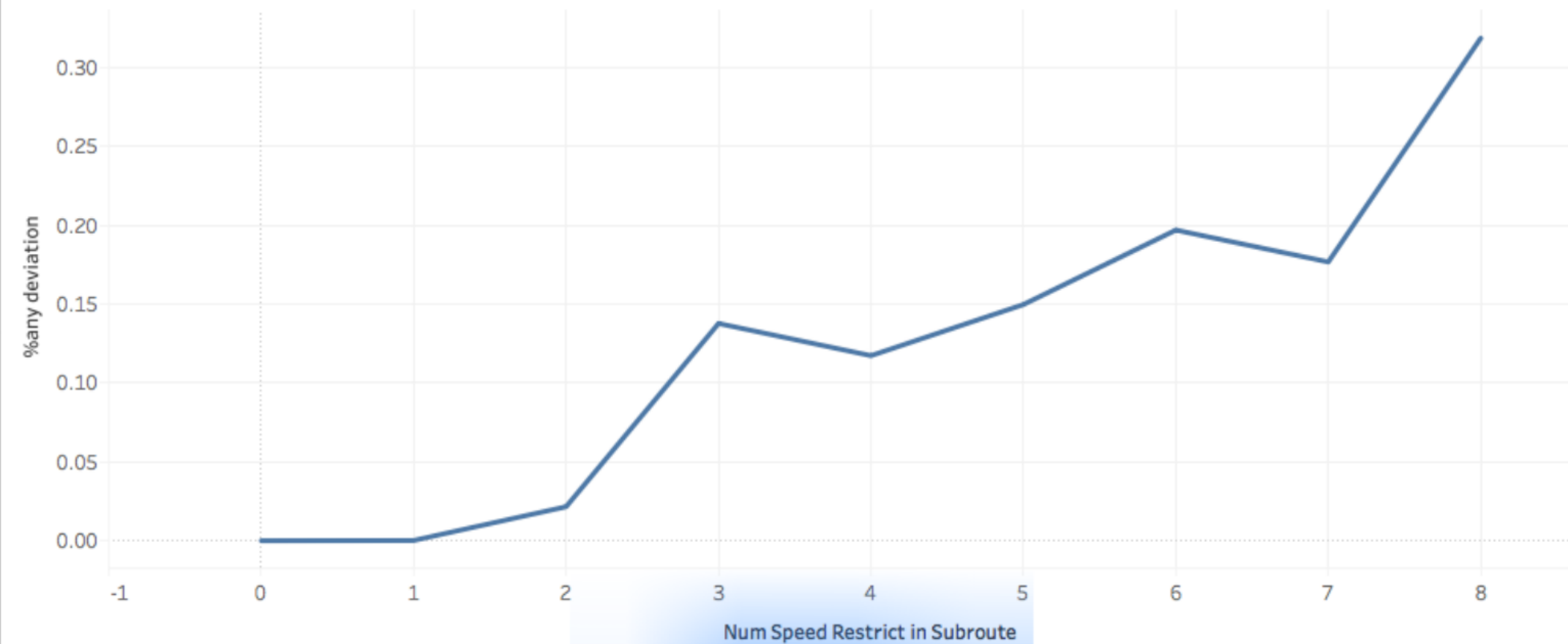
KMEM

Sheet 9



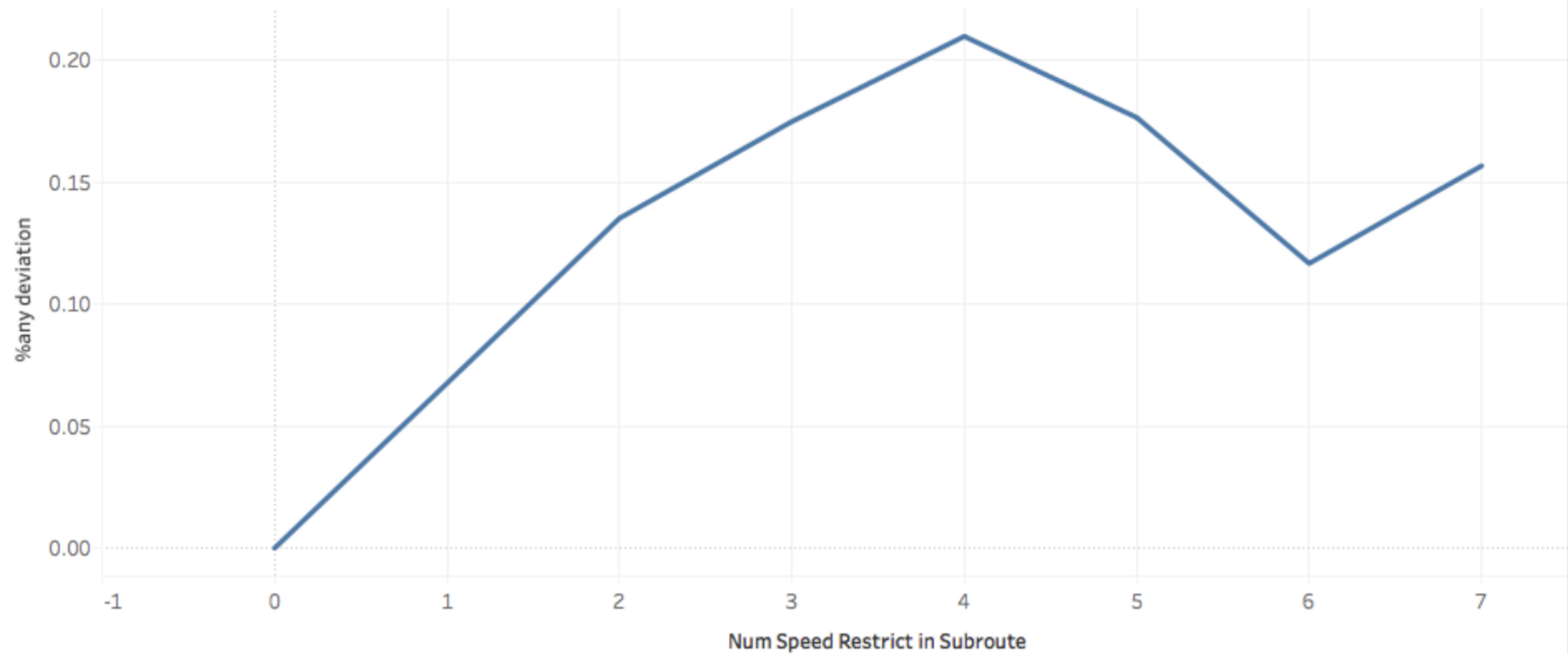
KIAH

Sheet 9



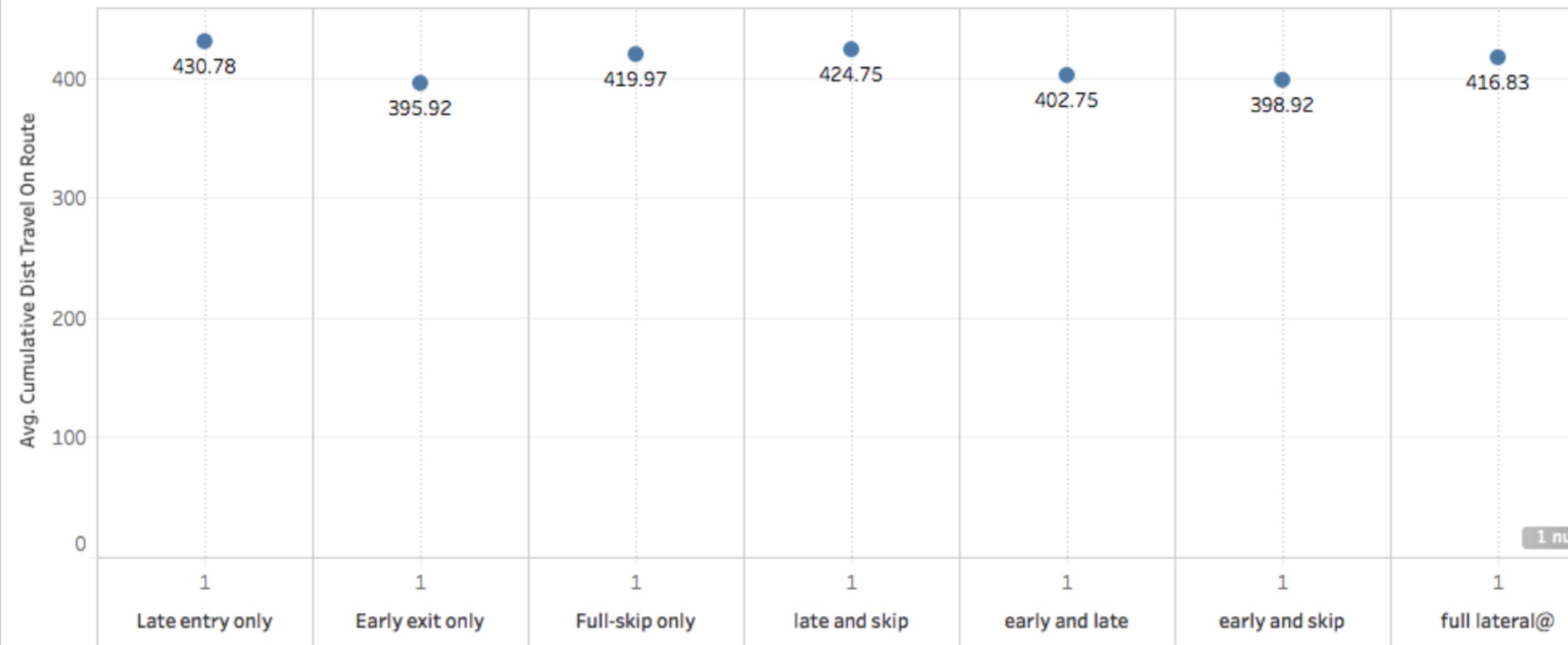
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Sheet 9

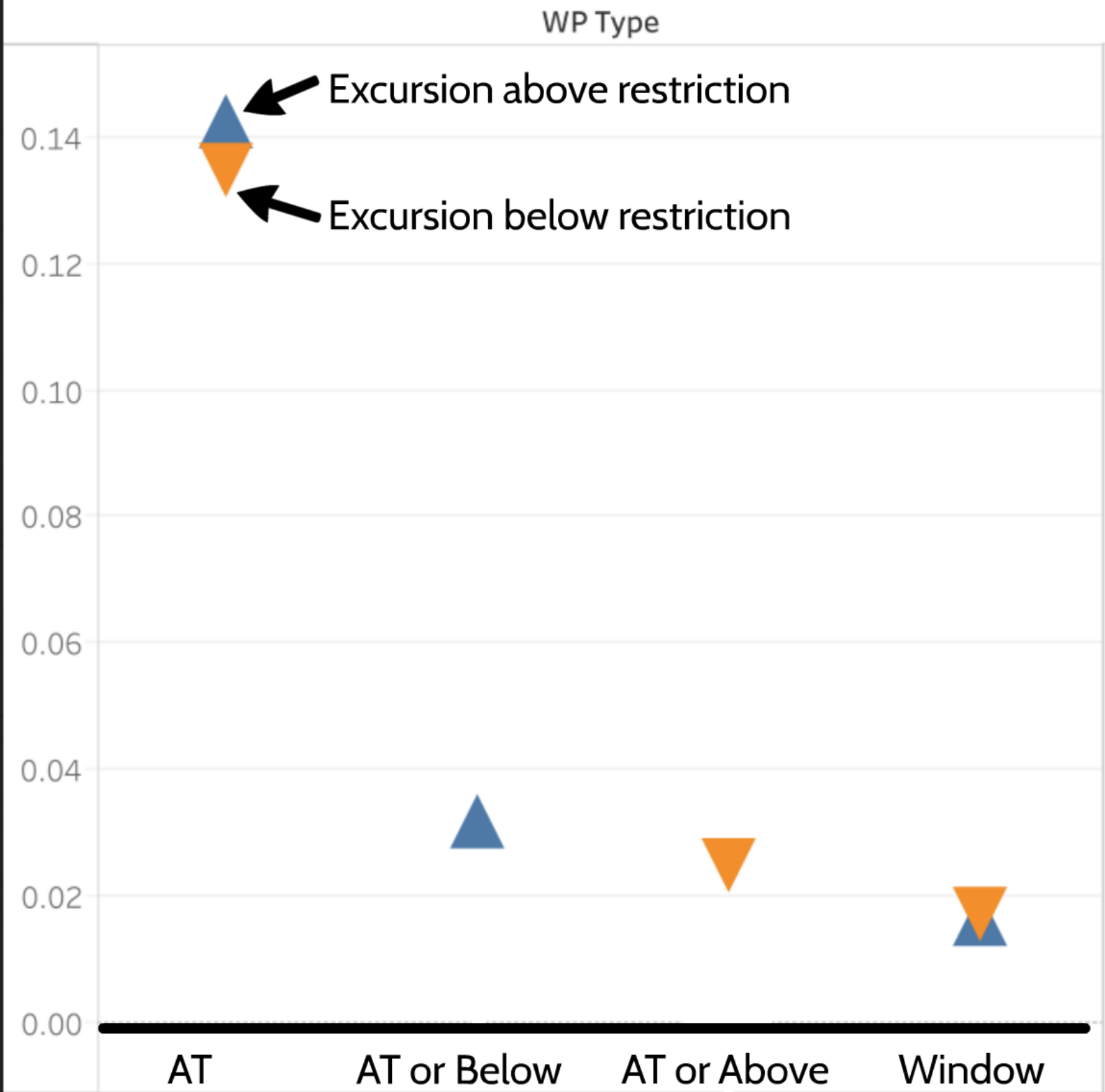


Miles Flown

Sheet 1



Excursion
Percentage



Machine Learning Methods

Multivariate Analysis

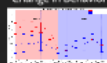
Classification

Precursors

Decision trees weigh multiple variables to predict the class of a variable

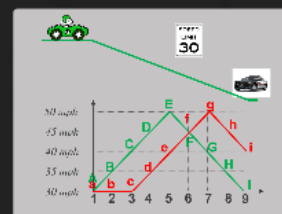


Change in Behavior



Adopt

Automatic Detection of Precursors in Timeseries



Methods

Multivariate Analysis

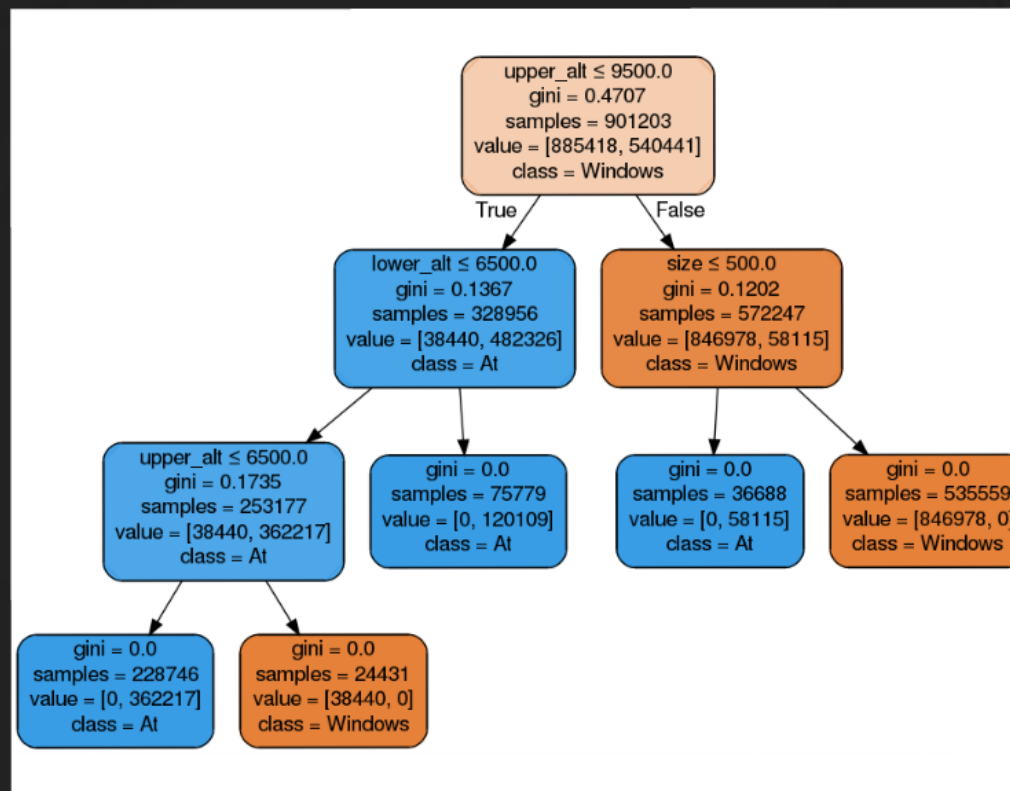
Classification



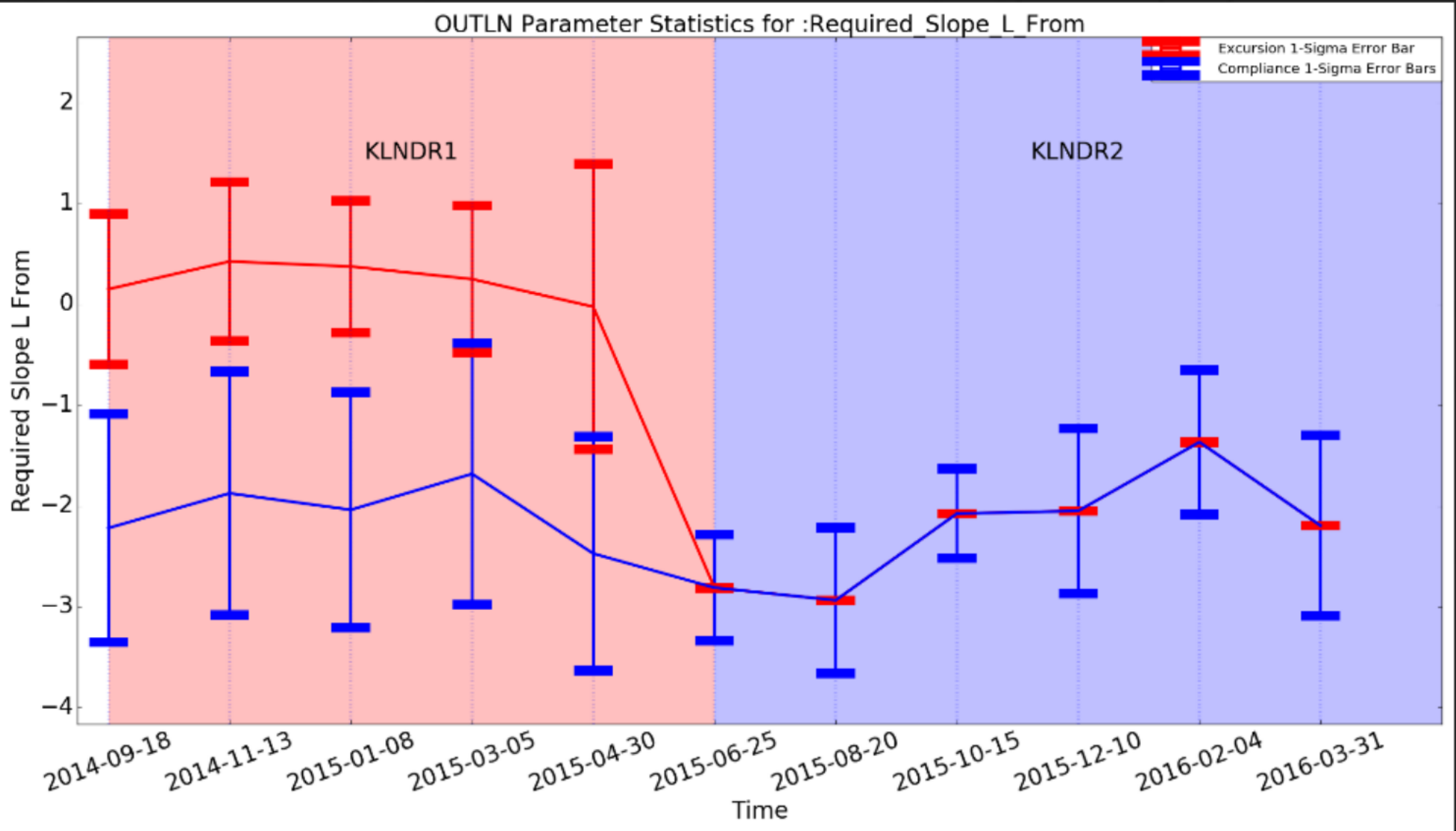
Precursors



Decision trees weigh multiple variables to predict the class of a variable

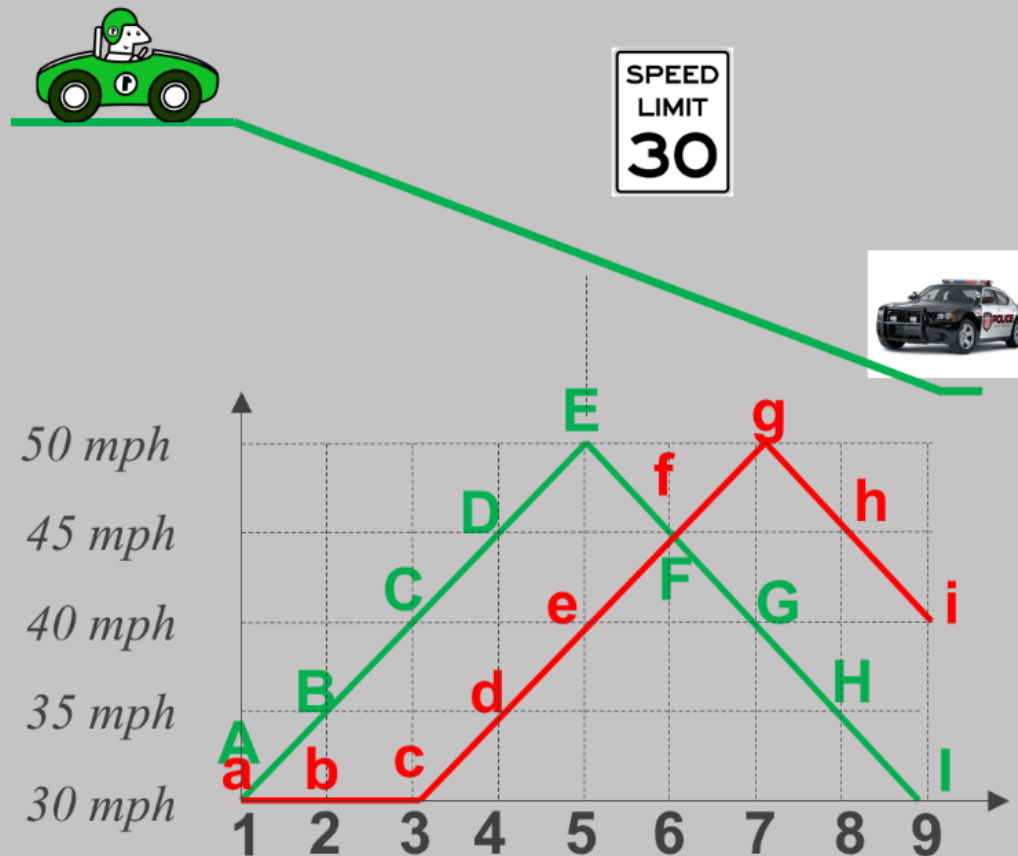


Change in Behavior



Adopt

Automatic Detection of Precursors in Timeseries



Output Tool

Data Visualization & synthesis

Monitor trends

Observe efficacy of mitigation strategies

Observe factors that influence degradation

Set acceptability metrics

Decision support for designers

Monitor trends

Observe efficacy of mitigation strategies

Observe factors that influence degradation

Set acceptability metrics

Decision support for designers

RNAV STAR Procedural Adherence

