

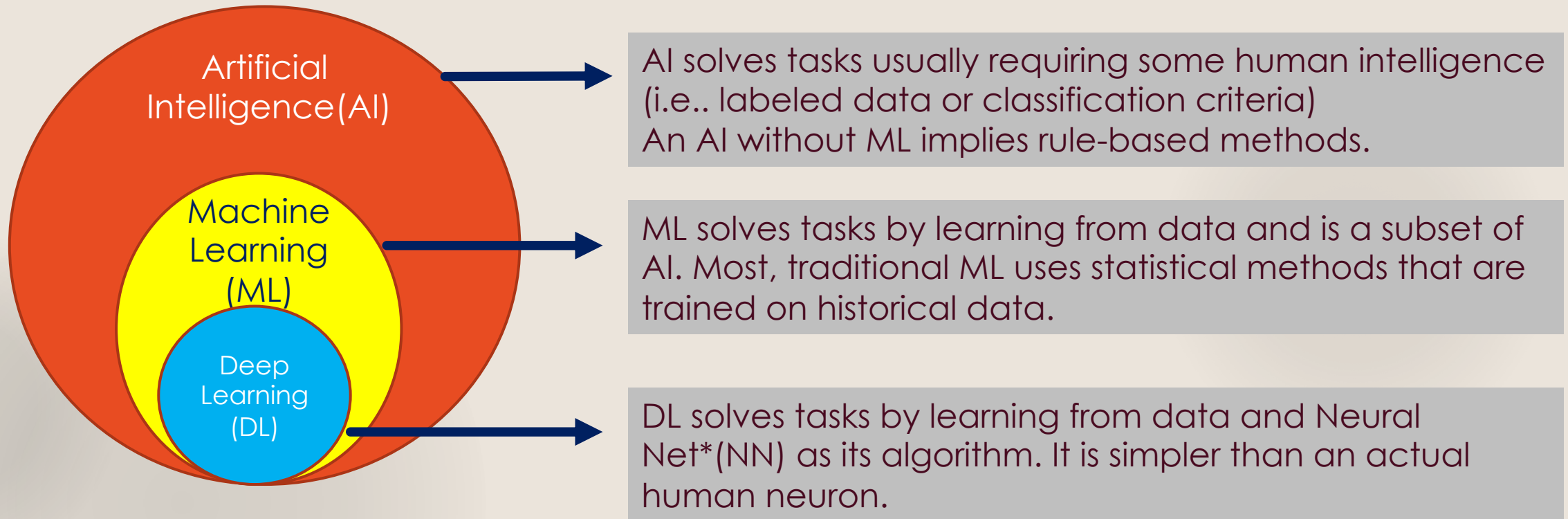
ROBUST AI:

*Implication to Vehicle
Platforms*

Approach to Robust AI

- ▶ The ultimate goal of next generation connected vehicle and mobility is to enable data driven platforms that provide accident free and efficient roadway utilization.
- ▶ Additionally, these platforms are expected to enable personalized user experience.
- ▶ This goal can be achieved through the application of intelligent data reduction and adaptive AI tools. This presentation discusses schemes that achieve an intelligent data processing platform for mobility.

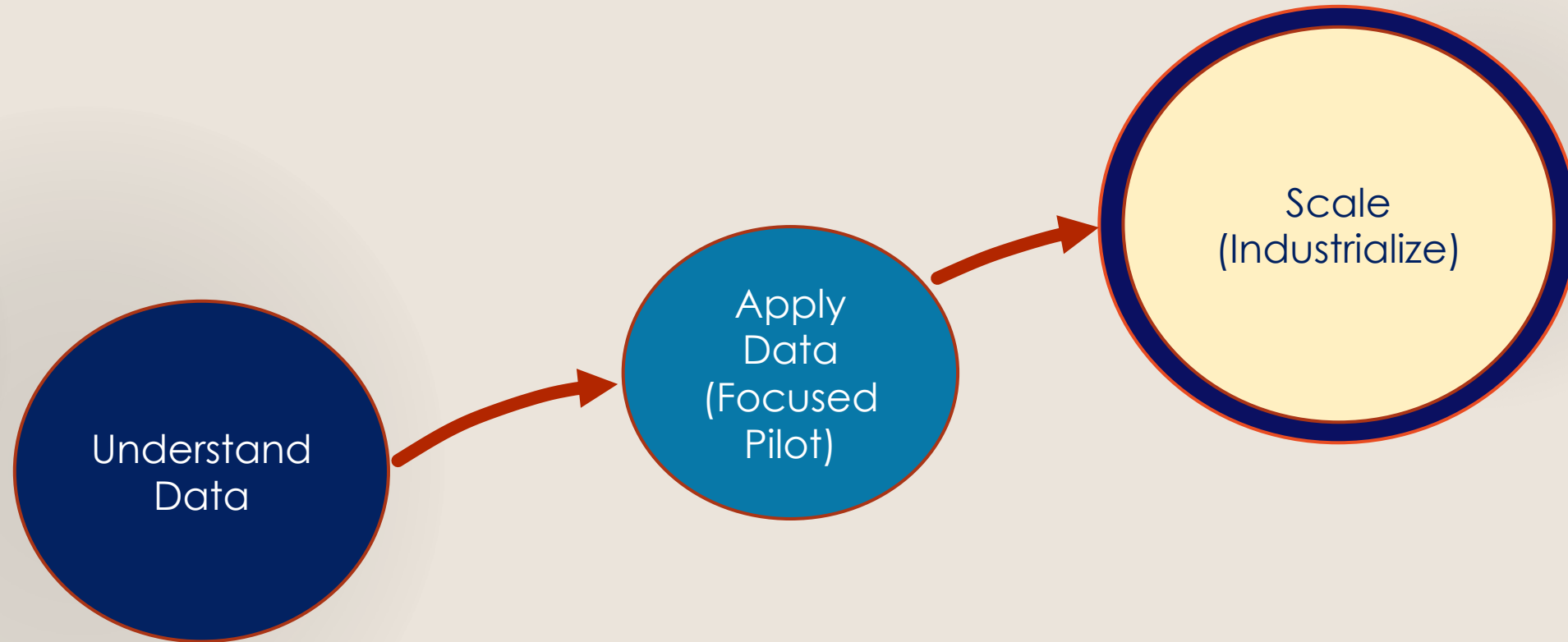
Background on AI



We need problem domain data representation not just lots of data.
Lots of data is needed in image learning for it can use concept of transfer learning.

*In NN a neuron compares the weighted sum of its inputs to a threshold potential, if it is positive it will send information through a activation function

Approach To Industrialize AI



Which is important: Algorithm or Data?

Understand
Data

- ▶ Machine learning performs best when it is trained with an extensive data set suitable for a specific task.
- ▶ Most sophisticated algorithms are available as open source.
- ▶ In general, spending time collecting, labeling, and categorizing good data is key to a successful application of AI to a problem domain.

Example Autonomous Vehicle: *What We KNOW about DATA*

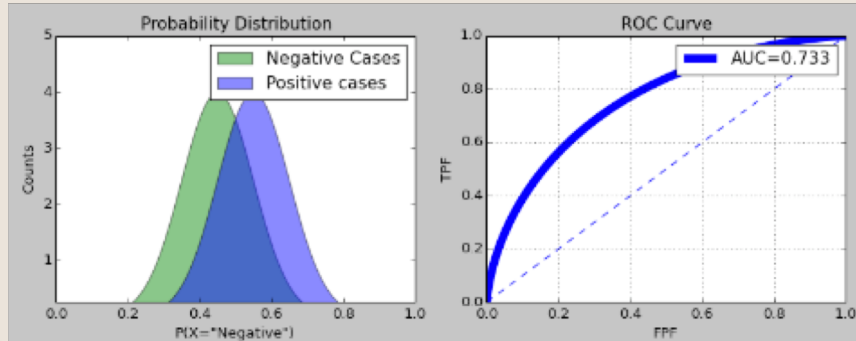
Apply Data
(Focused
Pilot)

- ▶ Data Flow: Vehicle-to-Vehicle (V2V) and Vehicle –to- external (V2X) devices and connected vehicle platform generate in-homogeneous, multi-faceted data.
- ▶ The data set size could be as small as few terabytes
- ▶ This data needs to be scrubbed, homogenized and scaled to facilitate visualization and Analyses.
- ▶ To obtain real time feedback for driver Assistance, this data needs to be reduced through loss less compression.

Detection Scenarios

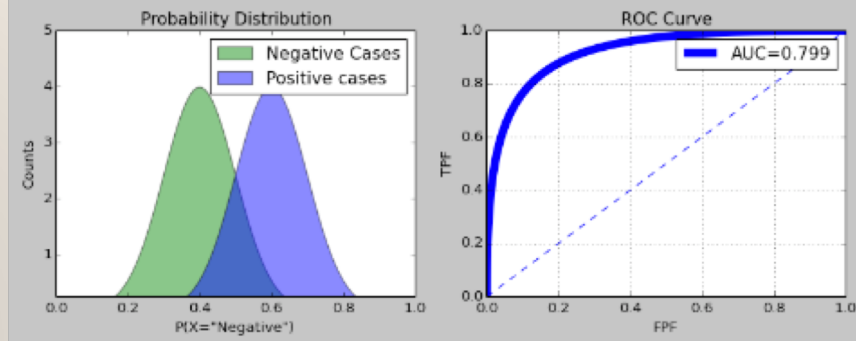
Apply Data (Focused Pilot)

Random Situation



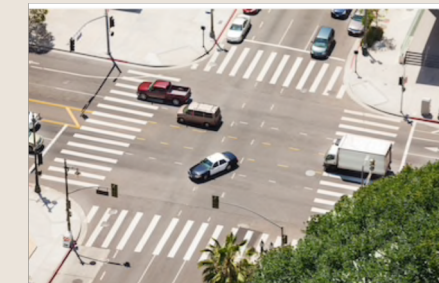
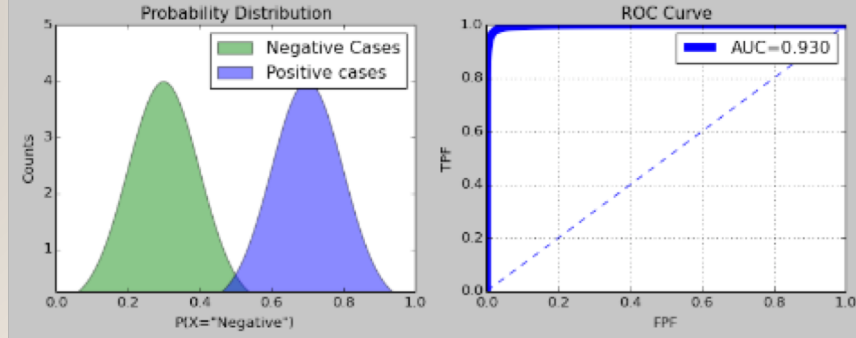
Accept FP's

Reasonable Detection



Choose Max AUC

Easy Detection



Use Cost Benefit

How do we evaluate Pilot ?

Autonomous vehicle example

Apply Data
(Focused
Pilot)

- ▶ After an AI algorithm is trained on data, we have to examine the performance of algorithm on a specific 'test' data set (especially in the area of vehicle and pedestrian detection). This determines a vehicles reliability and safety.
 - ▶ Providing AI results to users as an alarm or guidance and let users choose the best approach.
 - ▶ Use Receiver Operating Characteristic curve (ROC) – Area under this curve is used as a metric for performance. This method tend to emphasize sensitivity, if training data is skewed.
 - ▶ Use Net Benefit Method when evaluating effectiveness of an AI approach for driver assistance.
 - ▶ Automate evaluation technique to industrialize AI application.

Industrialization - Current State

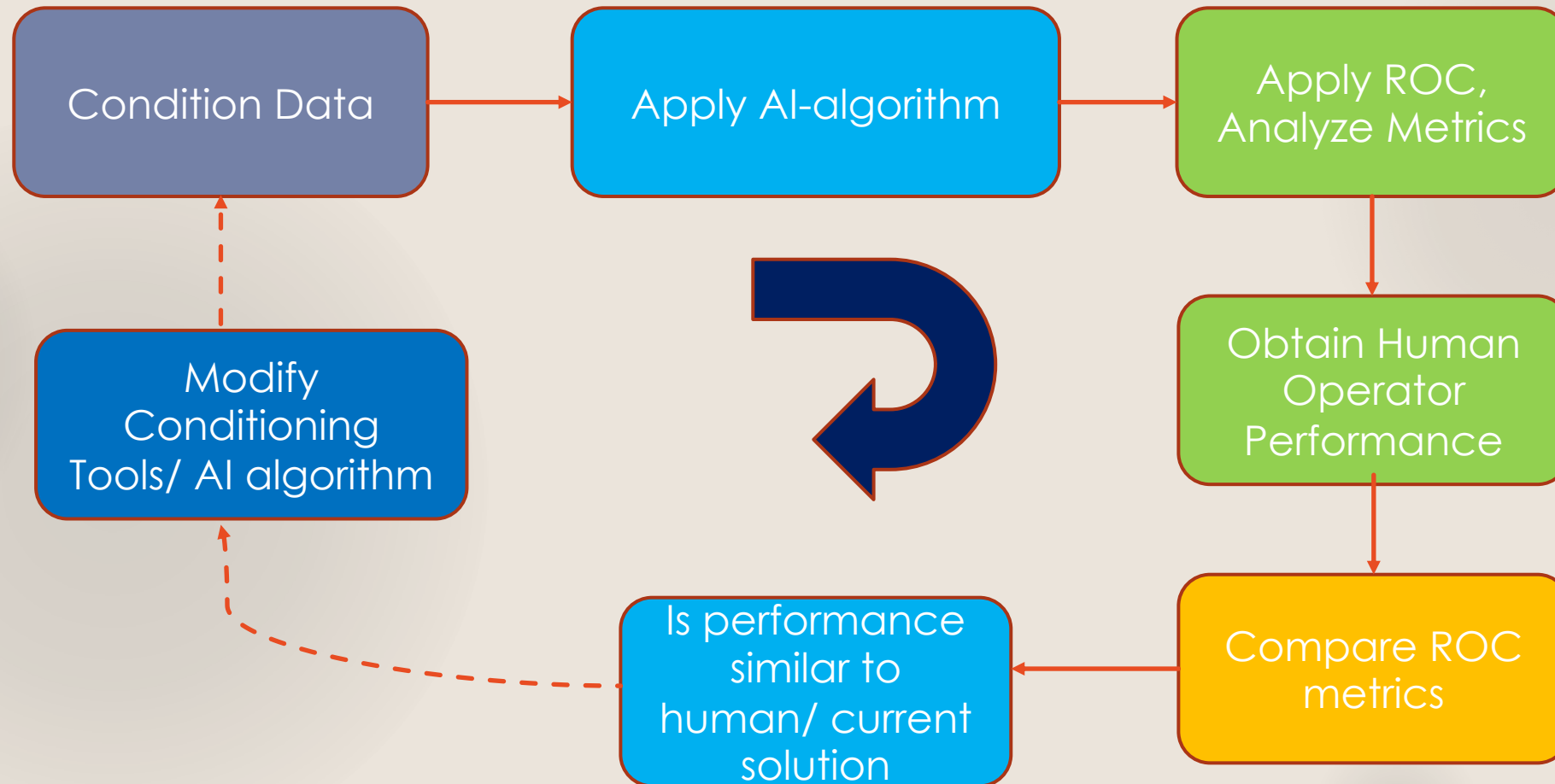


Scale
(Industrialize)

- ▶ We need common tools and processes to be adopted by all practitioners, to ensure uniform quality for many AI applications and to produce them in timely fashion.
- ▶ The tools like TensorFlow are standardized, however, the raw data is much messier, so tools for scrubbing and homogenizing this data needs to be standardized.
- ▶ The tools provided by industrial AI are customizable, simple but extensible.

Industrialization – An Iterative Process

Scale
(Industrialize)



Standardized tools:

Example Autonomous Vehicle for level 5

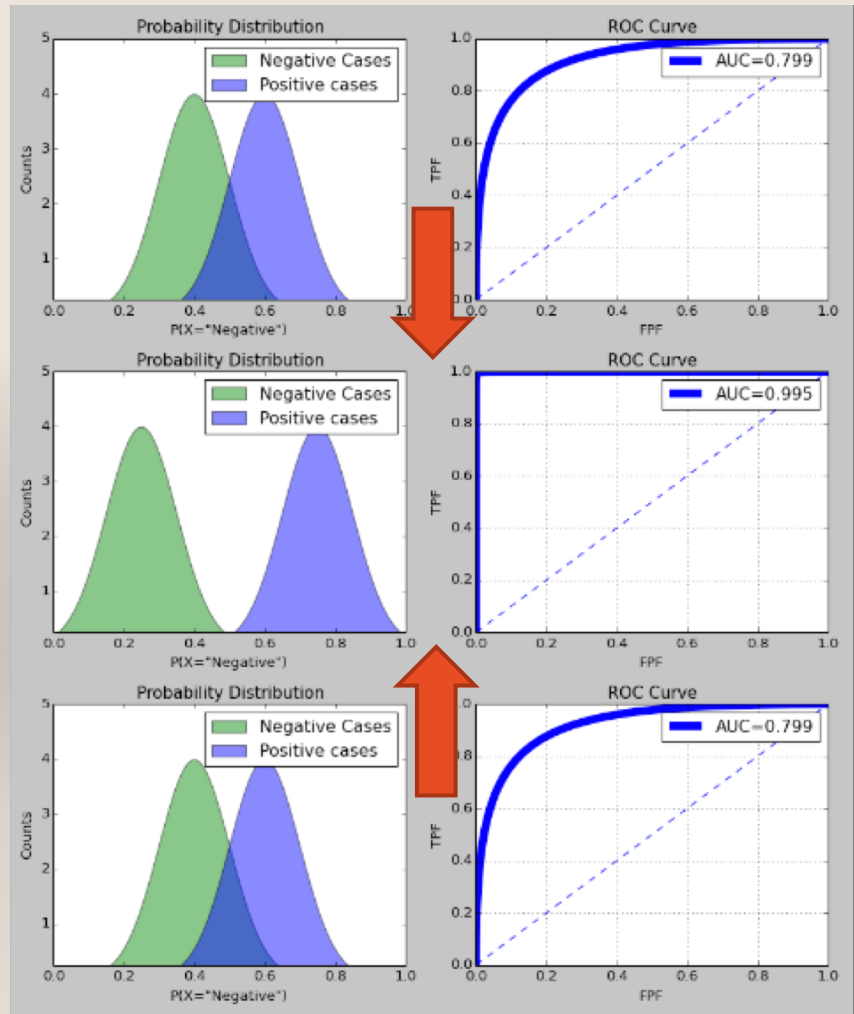


Scale
(Industrialize)

- ▶ A system of sensors to collect data.
- ▶ A processing unit that can scrub and represent useful data.
- ▶ A unit that homogenizes data and applies AI algorithm.
- ▶ A unit that provides data visualization and presents results.
- ▶ A unit that may control components.

Application of ROC for industrializing AI

Scale
(Industrialize)

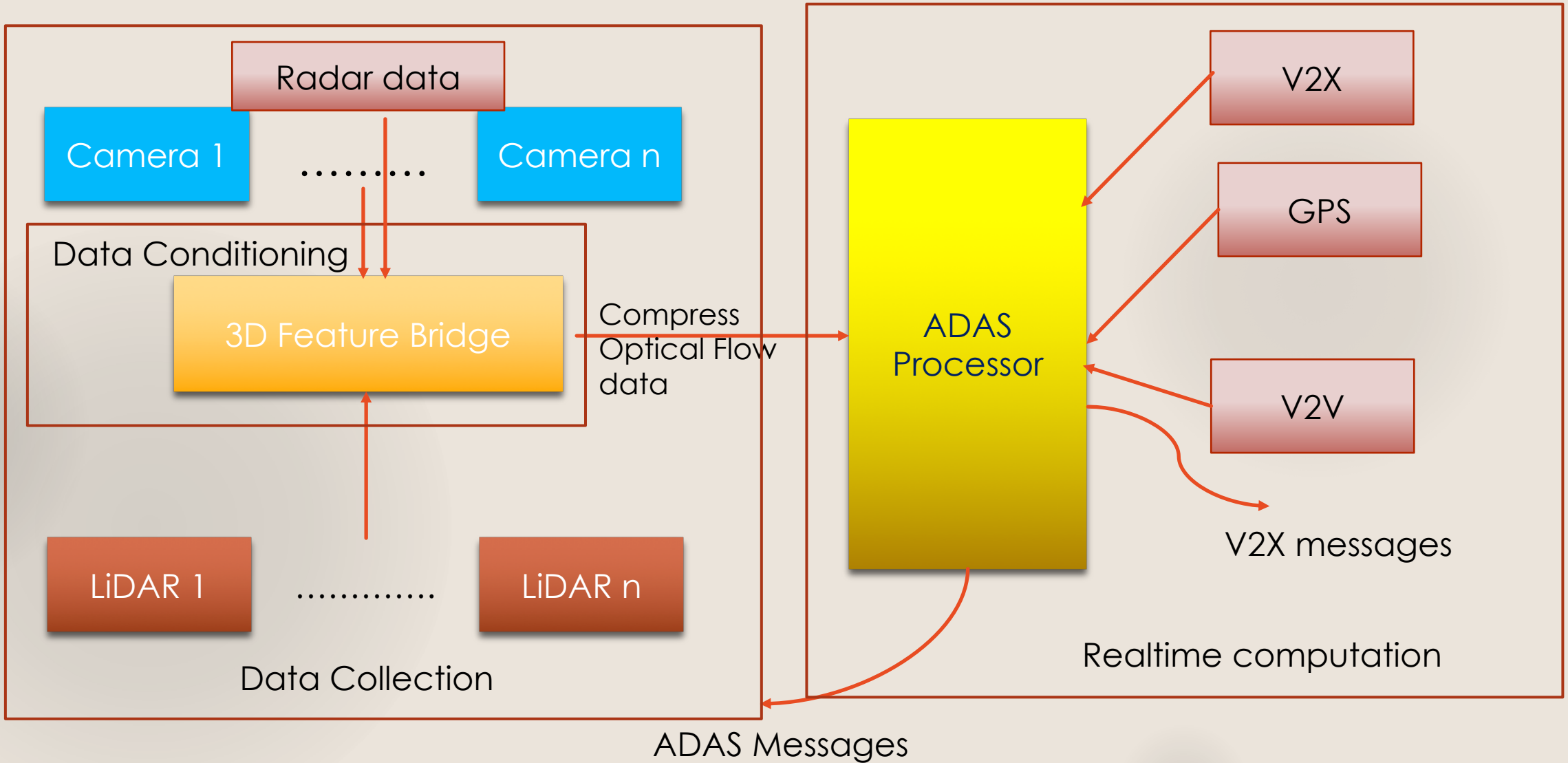


← Use V2X Data along with multi-sensors

← Use V2X Data along with multi-sensors

Helps improving an automated system with respect to human performance

Industrialization- Autonomous example



Conclusion

- ▶ Developing a process, standardized data preparation tools and result evaluation methods are essential for industrializing an AI application.
- ▶ Building standardized signal processing and computational module specification would enable Robust connected vehicle AI

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