Big Data in Transportation

Addressing the Big Data Challenges in ITS

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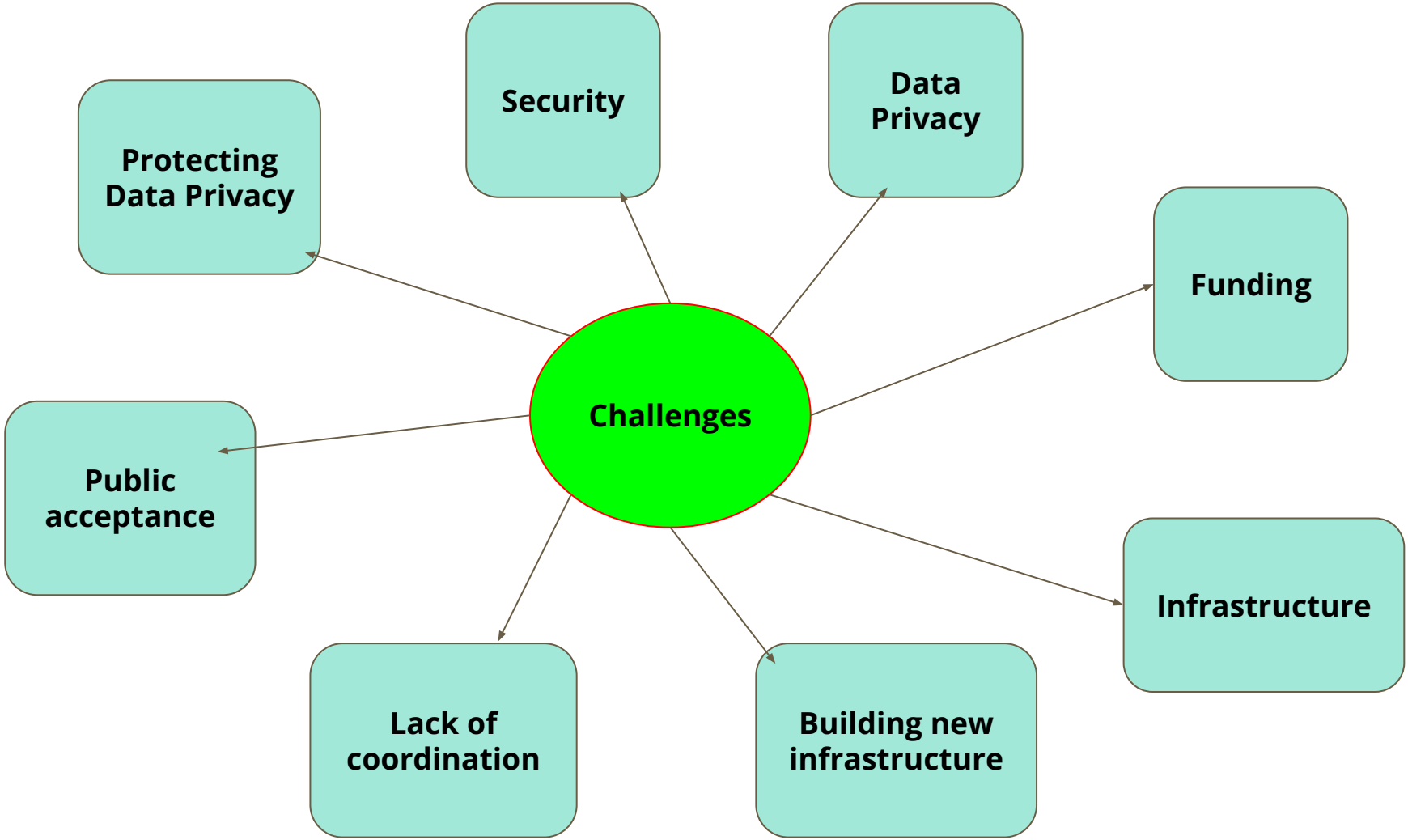

Challenges
Security
Data Privacy
Protecting Data Privacy
Funding
Public acceptance
Infrastructure
Lack of coordination
Building new infrastructure

Data Privacy & Security - Ethical Considerations

- **High**:
  - Strong laws and regulations.
  - Transparent data collection
  - Ability for citizens to control their own data
- **Medium:**
  - Not too comprehensive laws
  - Not well-enforced laws
  - Some transparent data
- **Low**:
  - Few or no laws and regulations
  - Opaque data collection
  - Citizens cannot control their own data

City	Data Management	Privacy
Singapore	High	High
Barcelona	High	Medium
Amsterdam	Medium	Medium
Copenhagen	Medium	High
Tokyo	Medium	Low
Dubai	Low	Low
Neom	Low	Very Low
NAC	Low	Low

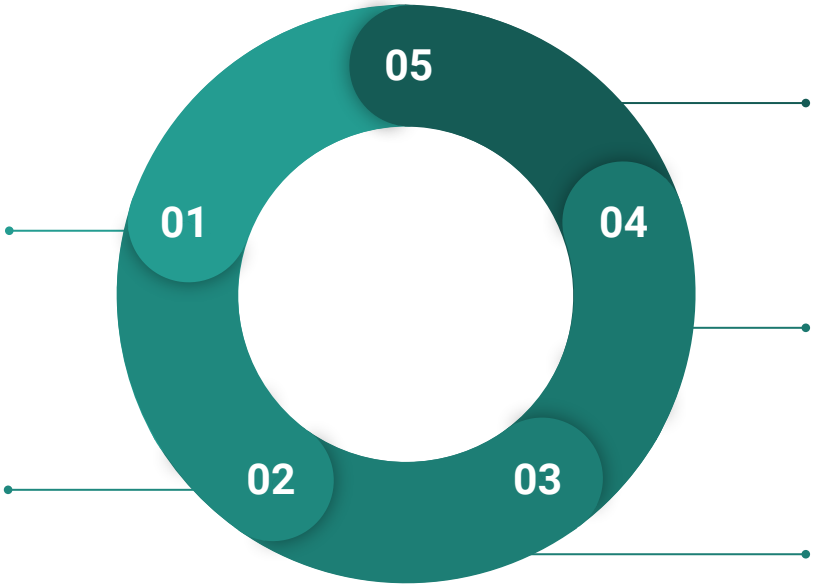
Data Integration and prediction of accidents

Data Collection and Integration

- Traffic Censors
- Cameras and Surveilance
- Weather Data
- GPS and location data
- Historical Accident Data
- Social Media and Mobile Data

Data Preprocessing and Fusion

- Data Preprocessing
- Data Fusion
- Temporal and Spatial Alignment



Advanced Analytics and Machine Learning

- Descriptive Analytics
- Predictive Modeling
- Real-time Analytics

Factors influencing Predictions

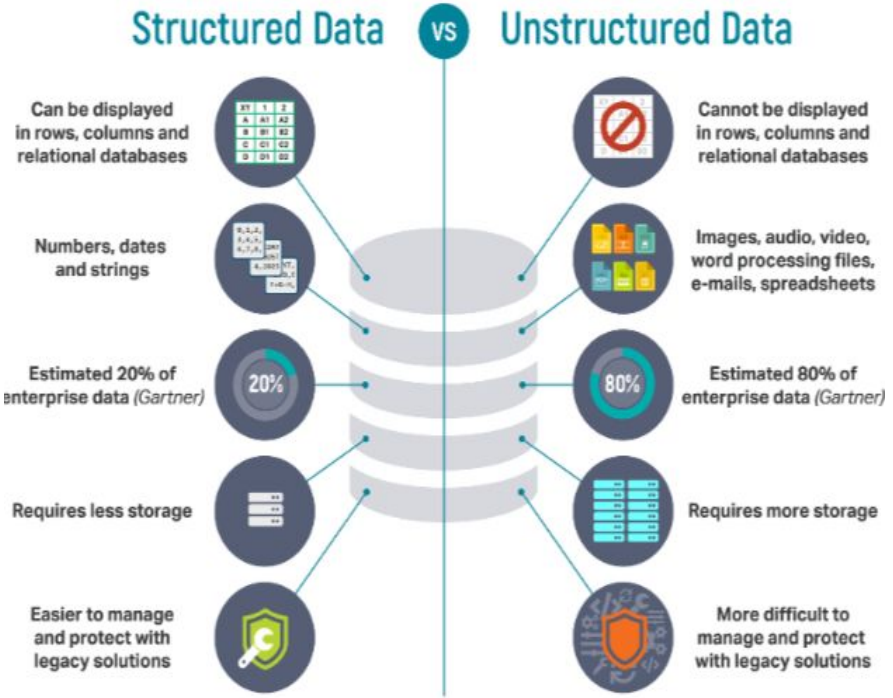
- Traffic Density
- Weather Conditions
- Driver Behavior
- Time of Day

Accident prevention model outputs

- Risk Scores
- Alerts and Warnings
- Decision Support Systems

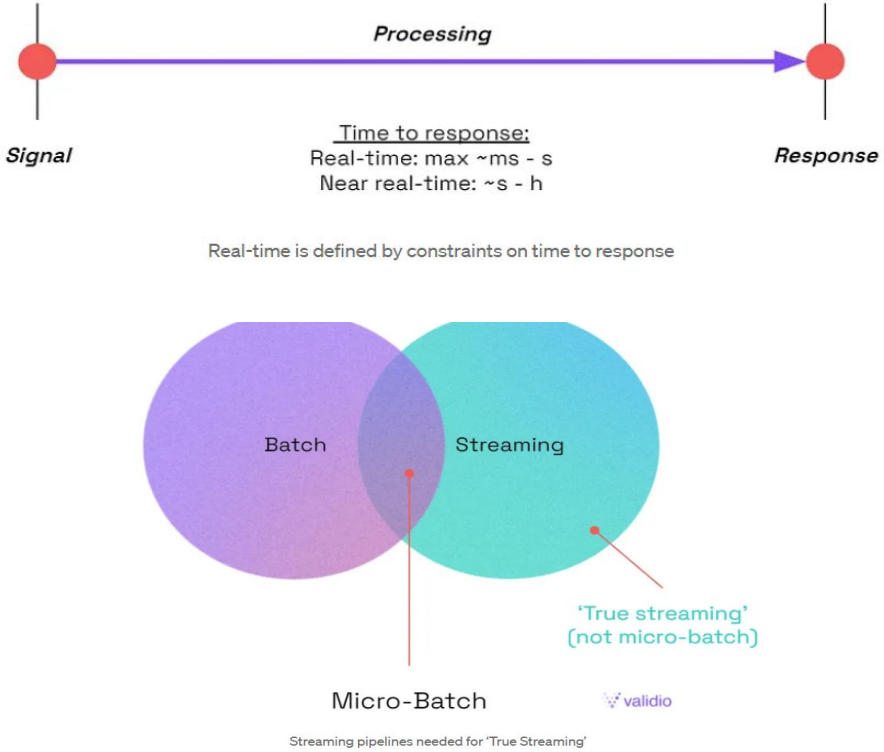
Challenges in Unstructured Data Storage in ITS

- **Diverse Data Formats**
  - Compatibility
  - Integration
  - Rapid Analysis & Real-time Processing
- **Storage and Retrieval Efficiency**
  - Volume
  - Speed
  - Cost Efficiency
- **Scalability**
  - Infrastructure
  - Maintainability
  - Anticipating Future-needs



Real-time vs Streaming Data

Real-time	Streaming data
• **Defined by** requirements of **maximum tolerance of time to response**	• Describing continuous data ingestion, **implying potential for decreased time to response**



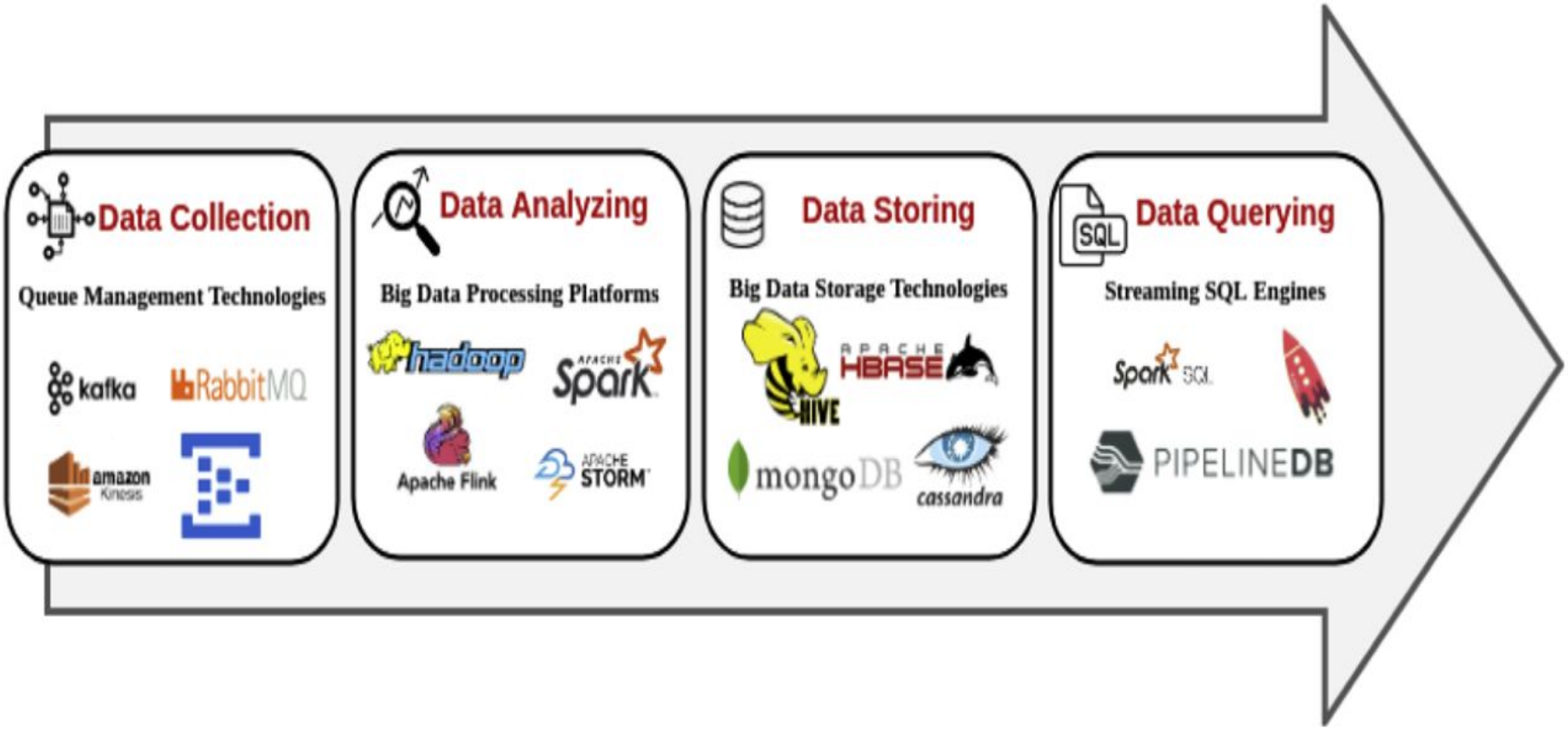


Fig. 1. Open-source big data pipeline analysis technologies.

Final Product - Smart Cities

- Benefits of ITS/Smart Cities
- Address challenges of ITS/Smart Cities using Big Data Techniques
- Deep Dive into machine learning algorithms utilized when predicting accidents
- Traffic data streaming using Kafka & Spark