Title: My Non-Geodesic Career Trajectory: From Entrepreneurship to Data & AI Consulting

Speakers: Alexandre Vincart-Emard

Collection: PSI 15th Anniversary Reunion

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# My non-geodesic career trajectory

## From entrepreneurship to Data & AI consulting

PSI 15th Anniversary Reunion

Alexandre Vincart-Emard – 2012 cohort
Perimeter Institute, Waterloo, ON

June 19th 2024

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PERIMETER INSTITUTE

## WORK EXPERIENCE

**Avanade**

- MLOps Practice Lead, aviation
- Data Science Lead, aviation
- Data Engineering Lead, aviation
- ML Engineer, aviation
- Data Engineering Offshore Supervisor, government
- Data Engineer, government

**Enkidoo Technologies**

- CTO: data engineering, web development, NLP

**TandemLaunch**

- Entrepreneur-in-Residence, startup foundry

## PERSONAL PROFILE

Alexandre Vincart-Emard, PhD

Manager at Avanade since January 2020

Artificial Intelligence practice (Data & AI)

## EDUCATION

- PhD in numerical physics, UBC, 2017
- MSc in theoretical physics, PSI, 2012
- BSc in mathematics and physics, UdeM, 2011

## TECHNICAL SKILLS

- Data science and ML (Python, statistics)
- Data engineering (PySpark, SQL)
- MLOps and DevOps
- Azure cloud technologies
- Analytics solution architecture
- Agile project management in Data & AI

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## EMAIL

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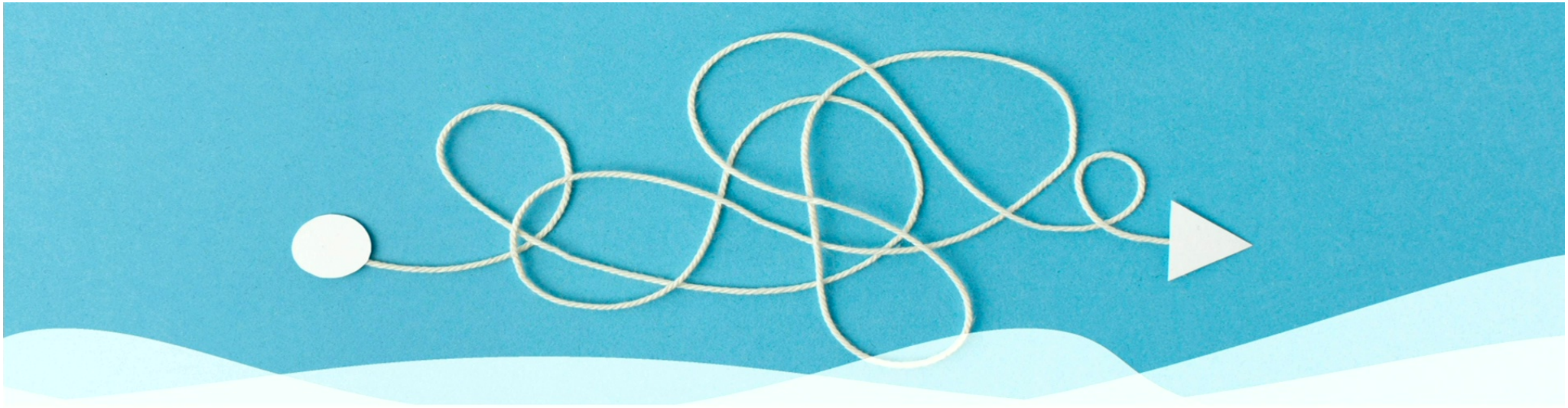

## Academia

PSI
UBC

## Entrepreneurship

TandemLaunch
Enkidoo

## Consulting

Avanade
Air Canada

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# The PSI years

## Before all the serious stuff

SIN(x) = 6

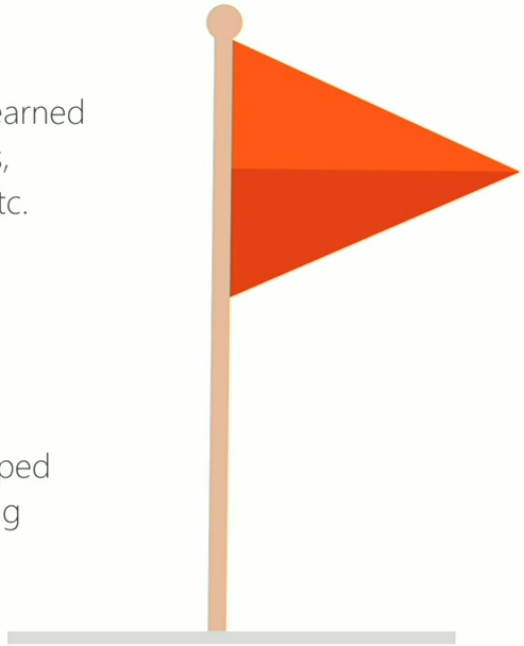
# What happened after *graduation*?

### Expanded my skillset

All I knew was Matlab and Mathematica, so I learned Python and OOP, explored ML/DL frameworks, dabbled in SQL, discovered cloud platforms, etc.

### Attended meetups

I met with data practitioners to increase the size of my network



### Created a portfolio

Personal projects (Kaggle, Youtube, fast.ai) helped me put into practice all the things I was learning

### Applied to jobs

Hoping that the data-heavy tasks of my PhD would make future employers curious to hear more

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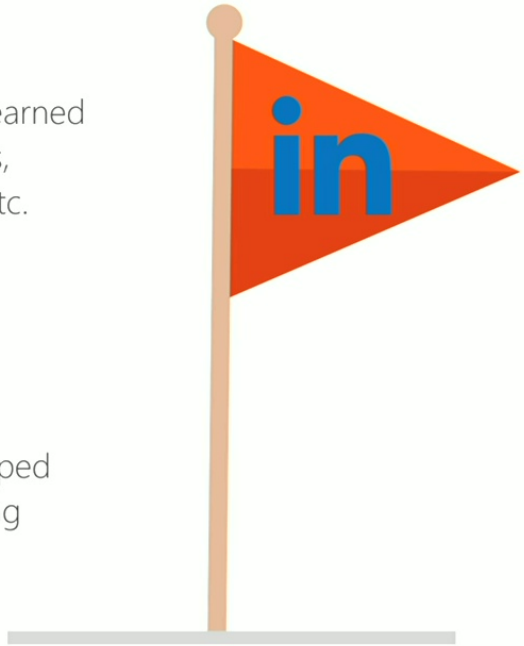

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# TandemLaunch

TandemLaunch is multiple things at the same time:

It is a startup foundry building innovative tech startups from scratch based on existing IP.

It's an accelerated business program for startups: funding, vesting, IP, leadership, etc.

It is an investment fund whose goal is to profit from accompanying the companies they seed.

- Hardware Devices
- Advanced Materials
- Computer Vision
- Artificial Intelligence

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### Recruit top talent

Look for candidates with a strong technical background who also showcase leadership.

### Scout for promising IP

Look at technology/patents from universities with a strong commercialization potential.

### Create strong business case

Create a convincing business plan for launching a tech startup (opportunities, market size, team composition, POC, etc.).

### Provide seed funding to launch the startup

TandemLaunch secures the IP and invests in the company in exchange for a fraction of shares.

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# Enkidoo

## Part POS data migration tool, part Supply Chain AI solution

### "Conversational analytics"

We wanted to empower business users to be able to interact with their business systems (ERP, POS) via a personal assistant/chatbot using NLP.

Rather than use complicated user interfaces, what if you could chat with your backstore and create product orders from missing inventory? Or ask what was your best seller in your Montreal store this week?

### Data migration

To be an AI startup is no easy task, and access to data is critical. We partnered with a large POS provider and helped them migrate all of their customers' retail data from their on-premise systems to the cloud.

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# What I learned taking the entrepreneur route

### Data engineering

- Building fault-tolerant and scalable data pipelines
- Data migration/ETL processes
- Databases and data formats
- Disaster recovery – Build for failure!

### Cloud engineering

- Separation of compute and storage
- Vast suite of services
- AWS vs GCP vs Azure
- Cloud solution architecture
- REST API

### Startup accelerators

- Mentorship
- Goal setting
- Communication (elevator pitch, knowing your audience)
- Value proposition

### Business strategy

- Market identification
- Data strategy
- Channel acquisition
- IP
- Grants and funding
- Investors

### Leadership

- Technology leadership
- People leadership
- Project management
- Balancing progress and uncertainty
- Addressing shifting priorities

FounderFuel CREATIVE DESTRUCTION LAB

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# Consulting

## Transitioning to the corporate world

# **Who** is Avanade?

Avanade is the leading provider of innovative digital and cloud services, business solutions and design-led experiences delivered through the power of people and the Microsoft ecosystem

## **Avanade** is the best of Accenture and Microsoft

Created in 2000 as a joint venture between Accenture and Microsoft, Avanade brings the best in professional talent, strategy, technology and execution to maximize value and results from your IT and digital investments

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# Avanade by the Numbers

**60,000+**
Skilled and diverse professionals

**24,000+**
Microsoft Certified Professionals

**7,500+**
Azure Certifications

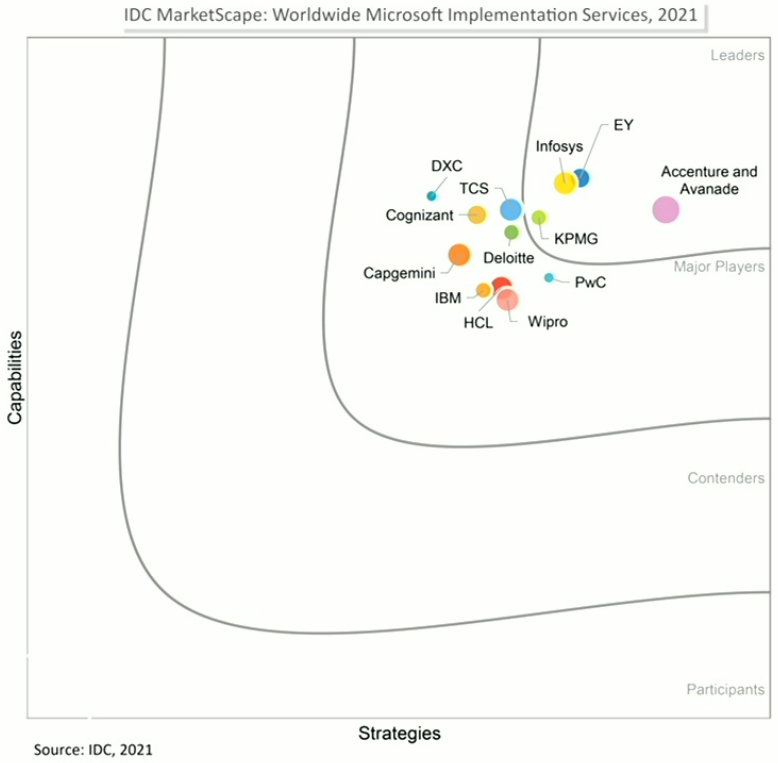
**81**
Locations across **26** countries

**46%**
Of Global 500 Companies as Clients

MICROSOFT 2023 GLOBAL ALLIANCE SI PARTNER OF THE YEAR -FOR THE 18TH TIME

**80,000+**
Virtual Machines migrated to Azure

**15,000+**
Azure Objects under Management




Source: IDC, 2021

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# Different organization

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# Working with Data & AI as consultant requires…

Deep technical knowledge

Process implementation mindset

Business acumen

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# Consulting in Analytics is…

### Bring tangible benefits

- We deliver solutions that answer specific business needs in the industry
- We accelerate initiatives via our past experiences (risk reduction)
- We identify new opportunities internally
- We align process and technology to reach new heights (change management)

### Establish trust and credibility

- We establish and maintain trust with our clients at every step of the way
- We work with integrity, always with our client's best interest at heart
- We listen to our clients' needs as they evolve, and adapt our work accordingly
- We establish credibility through respect, accountability, and technical expertise

### Work with cutting-edge technology

- We use cloud technologies to build interdisciplinary and innovative solutions that require deep technical knowledge
- We stay current with new technologies in a landscape where things move fast
- We develop scalable and repeatable solutions

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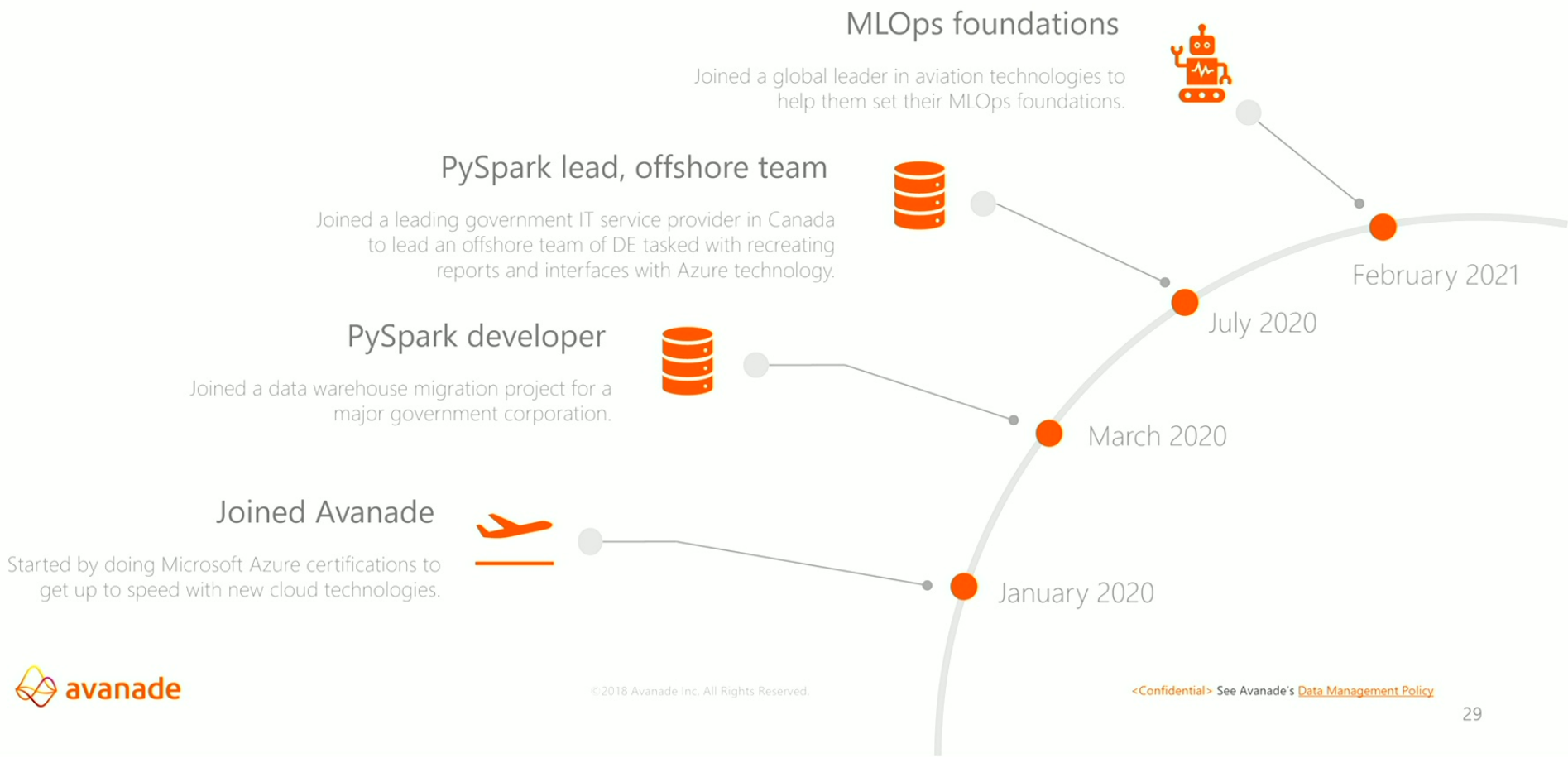
# My evolution at Avanade

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# Joining Air Canada

The place where things « clicked »

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# Internal AI CoE in service of business units

Air Canada's AI CoE drives all efforts related to data engineering, machine learning, AI architecture, MLOps and operations research to deliver cutting edge solutions across multiple business units.

Revenue Management

Network Planning

Cargo

Maintenance

Procurement

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# Air Canada – Revenue Protection (DE Lead)

During the post-pandemic recovery, some booking agencies would manipulate inventory to gain access to better seat classes (doing so against T&S), thus affecting Air Canada's bottom line. However, identifying them reliably was like finding a needle in a haystack. Furthermore, bookings and sales data came from different systems, with no immediate way to link one with the other.

We reverse-engineered the relationship between bookings and transactions to recontruct the sell request history for all new reservations, and wrote business logic to identify fraudulent transactions. The solution took the form of an automated daily pipeline that provided proofs of fraud to the users, with a close to 0% false positive rate, as well as a dashboard to visualize the results over time.

Air Canada users went from manually searching for fraudulent bookings to reviewing a daily list automatically generated for them (proof included), saving them countless hours. The tool helped AC recuperate millions of dollars in lost revenues within the first year of operations.

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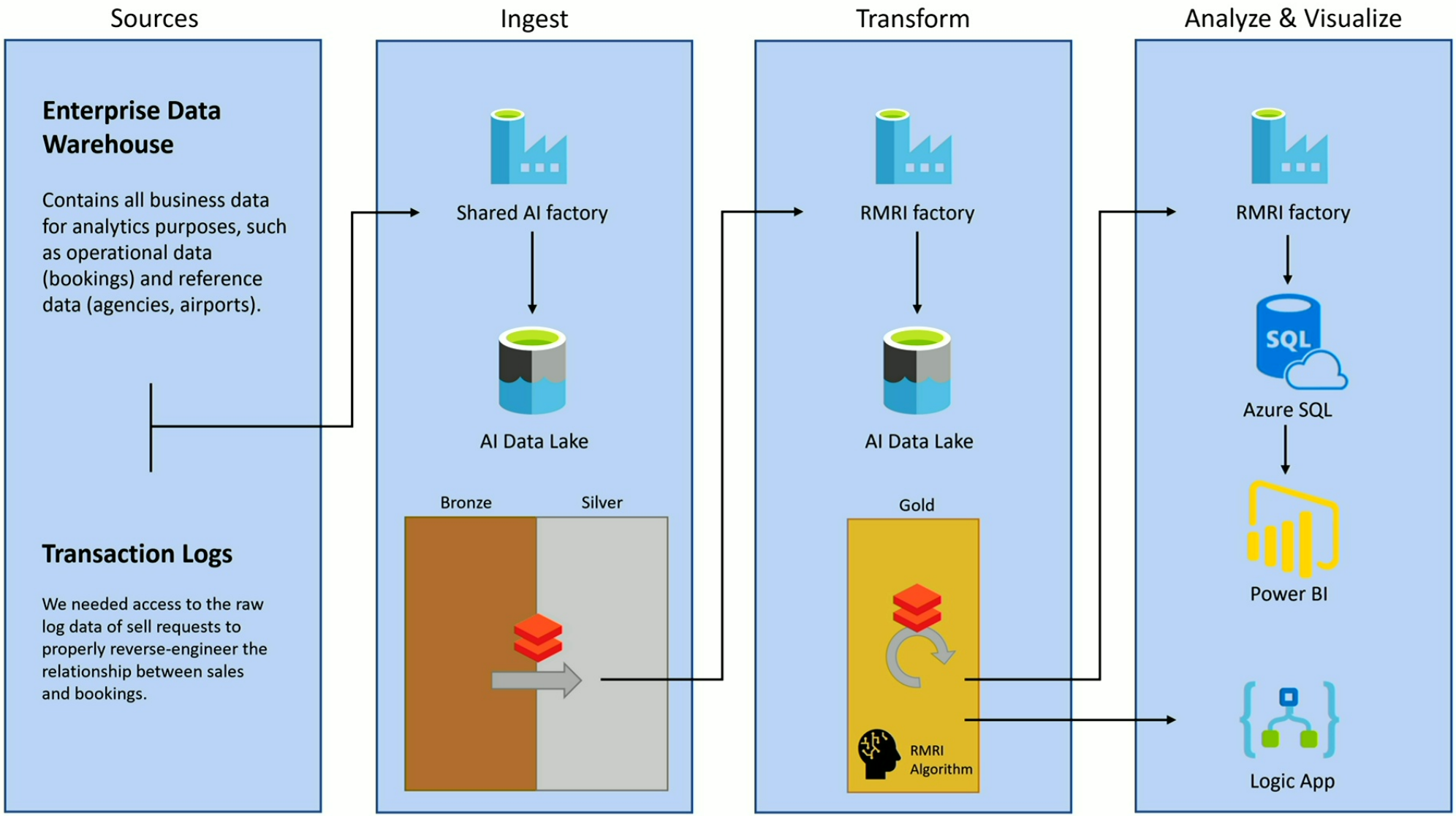
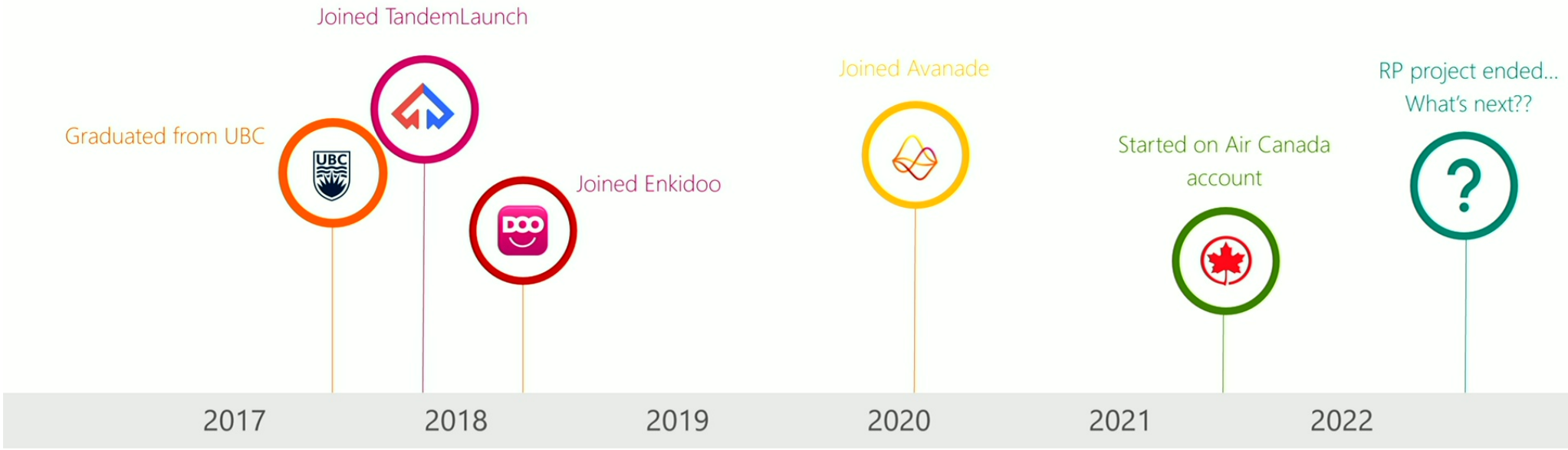

Sources
Ingest
Transform
Analyze & Visualize
Enterprise Data Warehouse
Contains all business data for analytics purposes, such as operational data (bookings) and reference data (agencies, airports).
Transaction Logs
We needed access to the raw log data of sell requests to properly reverse-engineer the relationship between sales and bookings.
Shared AI factory
AI Data Lake
Bronze
Silver
RMRI factory
AI Data Lake
Gold
RMRI Algorithm
RMRI factory
SQL
Azure SQL
Power BI
Logic App

# Identity Crisis

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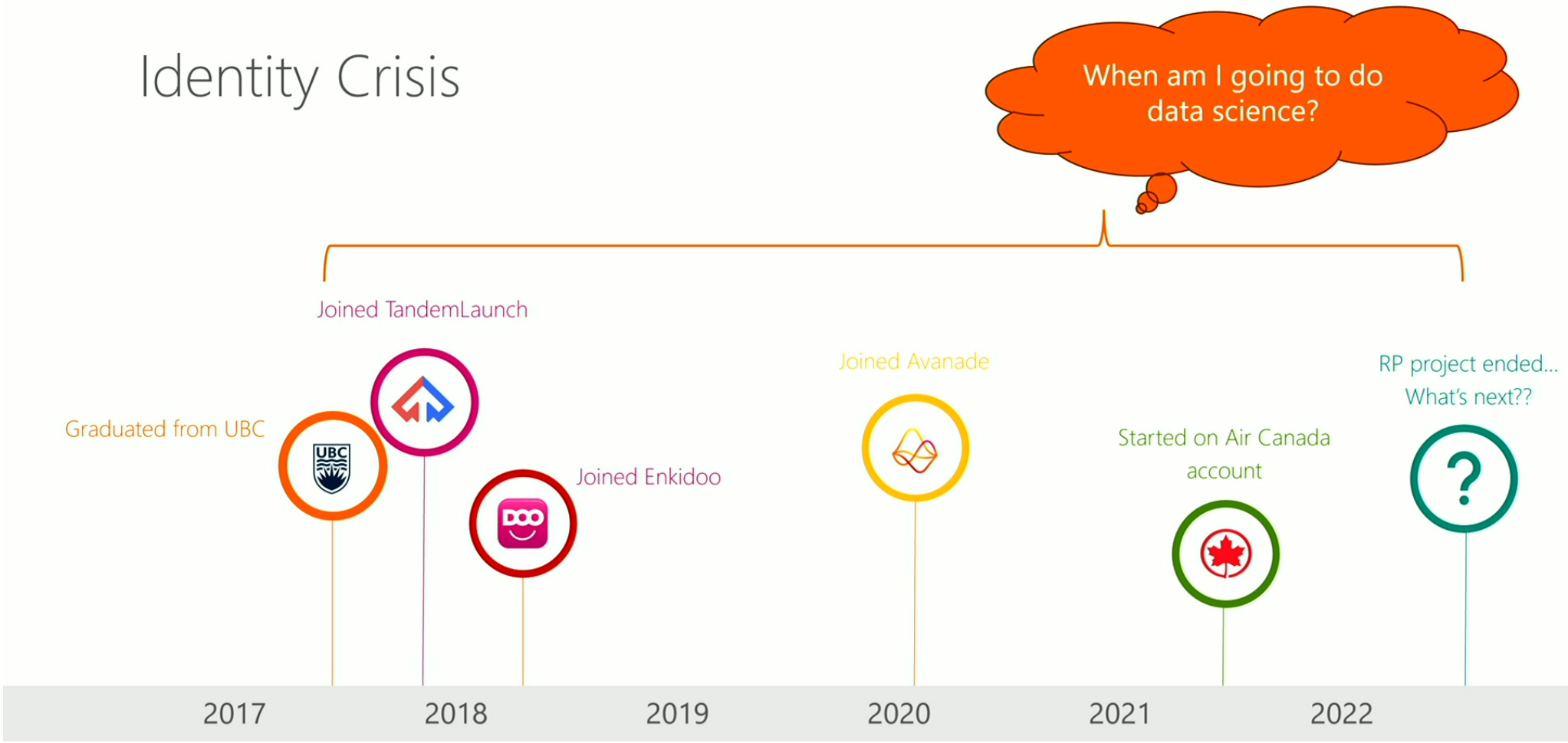
# Identity Crisis

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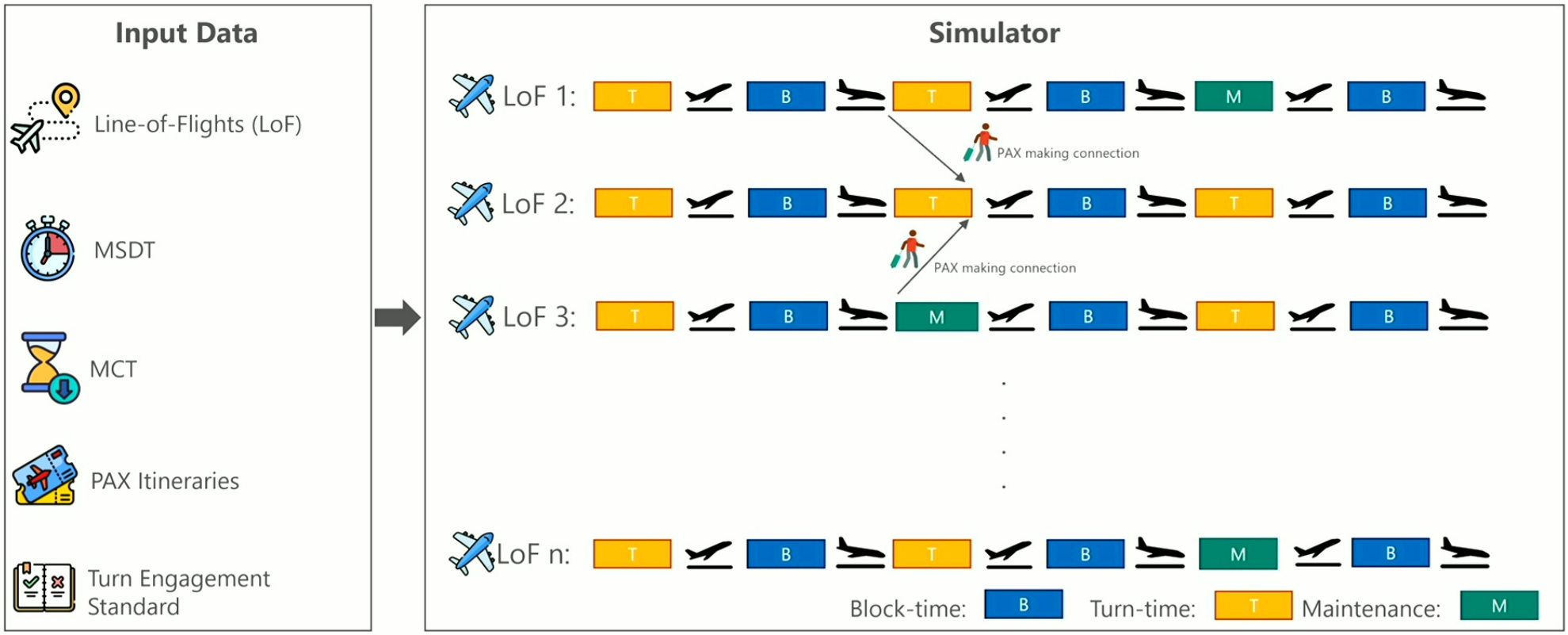
# Simulating a schedule

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# Air Canada – On-Time Performance (DS Lead)

Many things need to be taken into account when creating an airline schedule: MSDT, MCT, curfews, crew, grooming, customs wait times, Block strategy, new routes, new aircrafts, etc. So much so that it becomes difficult to anticipate how small changes might propagate across the entire network. What if we could simulate how a schedule might play out in advance?

We built a solution with three main components: (1) ML models to simulate events across an aircraft's line of flying, (2) a simulation engine that chains these model calls with additional constraints such as gate assignment logic over the whole network, and (3) a dashboard to visualize the outcome of the simulation on flights, passengers, crew, and more.

The simulation results offer insights about the schedule's stress areas, provides an estimate of OTP KPIs and passenger misconnections, and enables data-driven analysis of what-if scenarios, all of which can help the users make more optimal strategic choices when creating the schedule. This process also automates data analysis for non-technical users, and improves the synergy between the scheduling and operations teams.

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# How to establish trust?

Take ownership
Be proactive
Anticipate needs

Be vocal
Communicate clearly
Adapt to your audience

Be sincere
Be honest
Be authentic

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# MLOps Practice Lead

Revenue Management

Network Planning

Cargo

Maintenance

Procurement

- Support and maintenance
- Gap analysis
- Standards and guidelines
- Repeatability, scalability, efficiency
- Performance monitoring

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# Roles in Data & AI

## Beyond data scientist

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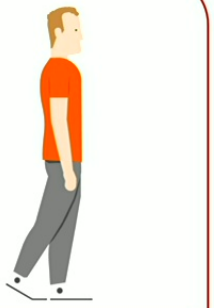

## Data Analyst

- Develops **domain knowledge** in the industry and area they are working in.
- Works closely with other teams (business and technical) to understand their needs and ensure the **technical roadmap answers the business requirements**.
- Participates in the creation of **scalable and repeatable business processes** using Data & AI.
- Creates clear and compelling **reports/dashboards** to facilitate communications with stakeholders.

**Technical skills:** Excel, PowerPoint, statistics, Power BI (visualization), coding* (SQL, Python)

## Data Engineer

- Designs, develops, tests and maintains **highly scalable data pipelines**.
- Ensures **data consistency** across multiple sources, and **integrates systems** for seamless data flow and access.
- Optimizes queries, monitors workloads, and modifies infrastructure as required to maintain **optimal performance**.
- Implements measures to ensure data accuracy and **security**, as well as compliance with data **governance** standards.

**Technical skills:** Databases and data processing systems, orchestration, coding (Python, SQL, Scala), Hadoop/Spark, data warehousing, OLTP vs. OLAP

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## Data Scientist

- Uses critical-thinking, creativity and data-driven insights to **solve complex business problems**, and communicate results with key stakeholders to assist in strategic decision-making .
- Performs **advanced statistical analysis** on datasets to understand patterns, anomalies, and relationships within the data.
- Builds **predictive models and ML algorithms** (POC/prototypes), and validates their performance .
- Establishes **processes** for analyzing and monitoring model performance.

**Technical skills:** Coding (Python, R, SAS, SQL), databases, statistics, optimization, scientific communication

## ML Engineer

- Responsible for the **operationalization of ML models** developed by data scientists, from POC to real-world applications.
- **Automates** model training and model deployment via CI/CD/CT.
- Implements **performance and data drift monitoring** of ML solutions.
- Ability to **design and implement Data & AI cloud architectures** to serve ML solutions at scale.

**Technical skills:** Coding (Python), algorithms and data structures, cloud infrastructure, software engineering (+ DS skills)

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## Solution Architect

- Designs the **overall structure of the AI system**, including the selection of appropriate technology components.
- Ensures the **integration of the new systems with existing infrastructure** and software.
- **Communicates with stakeholders** to validate that business requirements are properly translated into technical specifications while meeting compliance requirements.
- Supervises and guides technical teams to **deliver on time and within budget** while meeting the objectives.

**Technical skills:** Deep knowledge of cloud infrastructure, software engineering principles, data governance, data security

## Cloud Infra/DevOps

- Sets up and maintains the **infrastructure and environments** (dev, uat, prod) that support the development of AI applications (compute servers, storage, networking, RBAC security, etc.).
- Automates the **build, deployment and testing** of a solution's various components to the production environment by implementing CI/CD best practices.
- Monitors system performance and troubleshoots issues to **ensure smooth operation of AI applications** as per SLAs.

**Technical skills:** Systems administration, infrastructure as code, coding, Git, cloud architecture

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# Examples of technical problems in AI solutions

How to I perform ETL on 20 TB of data efficiently and cost-effectively? What about CDC?

How do I run semi-real time inference on 100K models all at once?

How can I fine-tune a LLM with business domain knowledge while keeping costs reasonable?

How do I retrain and redeploy 50K models on a weekly basis?

How do I ingest, transform and aggregate high-throughput streaming IoT data?

How do I keep inference runtimes below 40 ms per call consistently?

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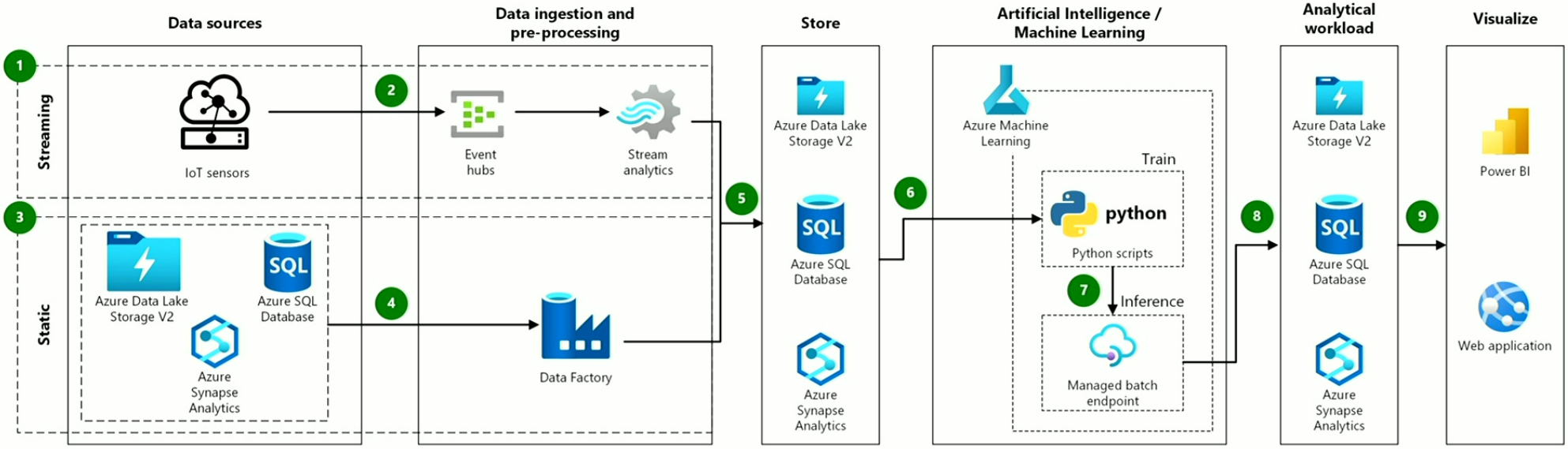
# Architecture – Batch scoring for streaming data




Microsoft Azure

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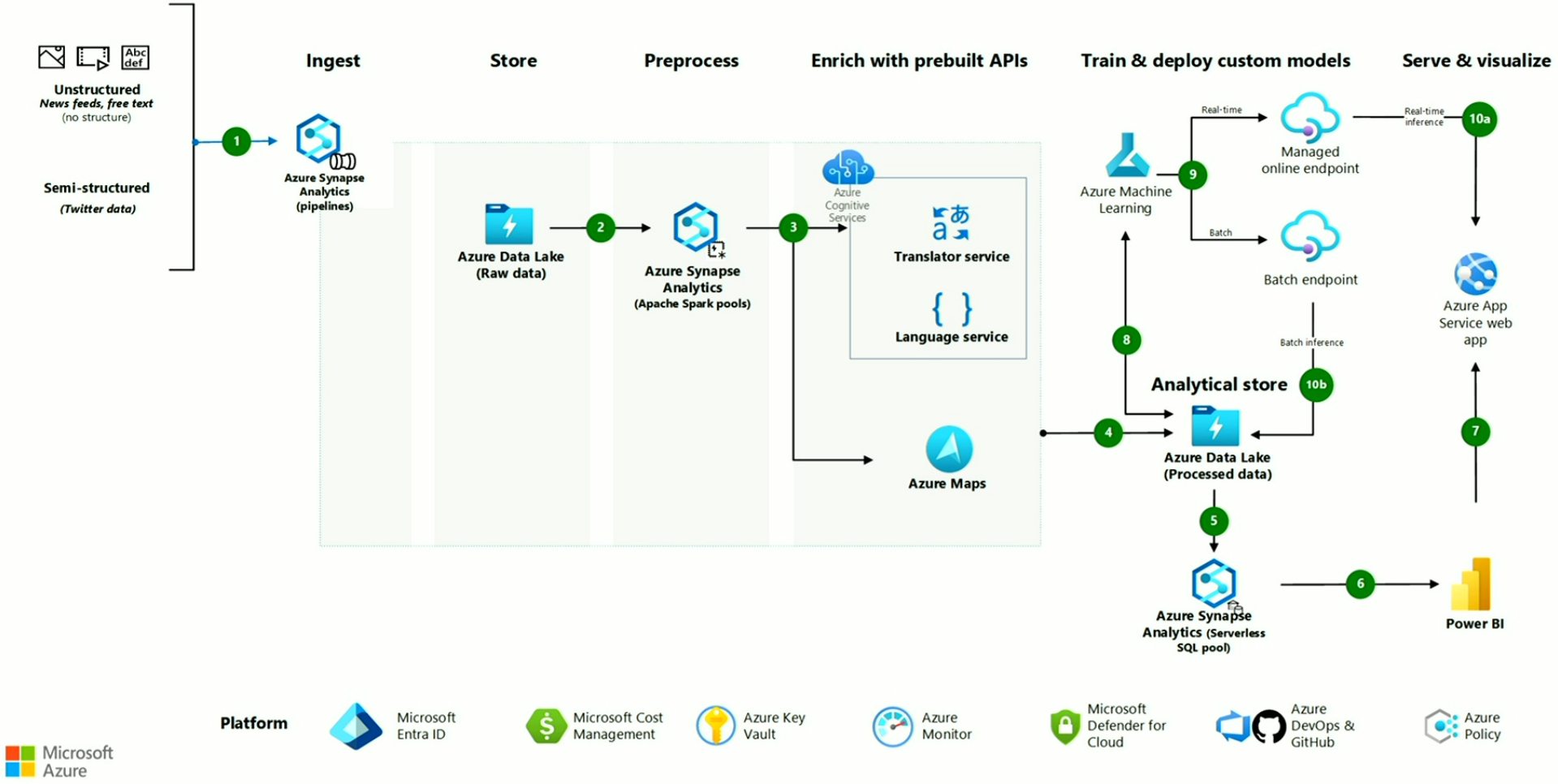
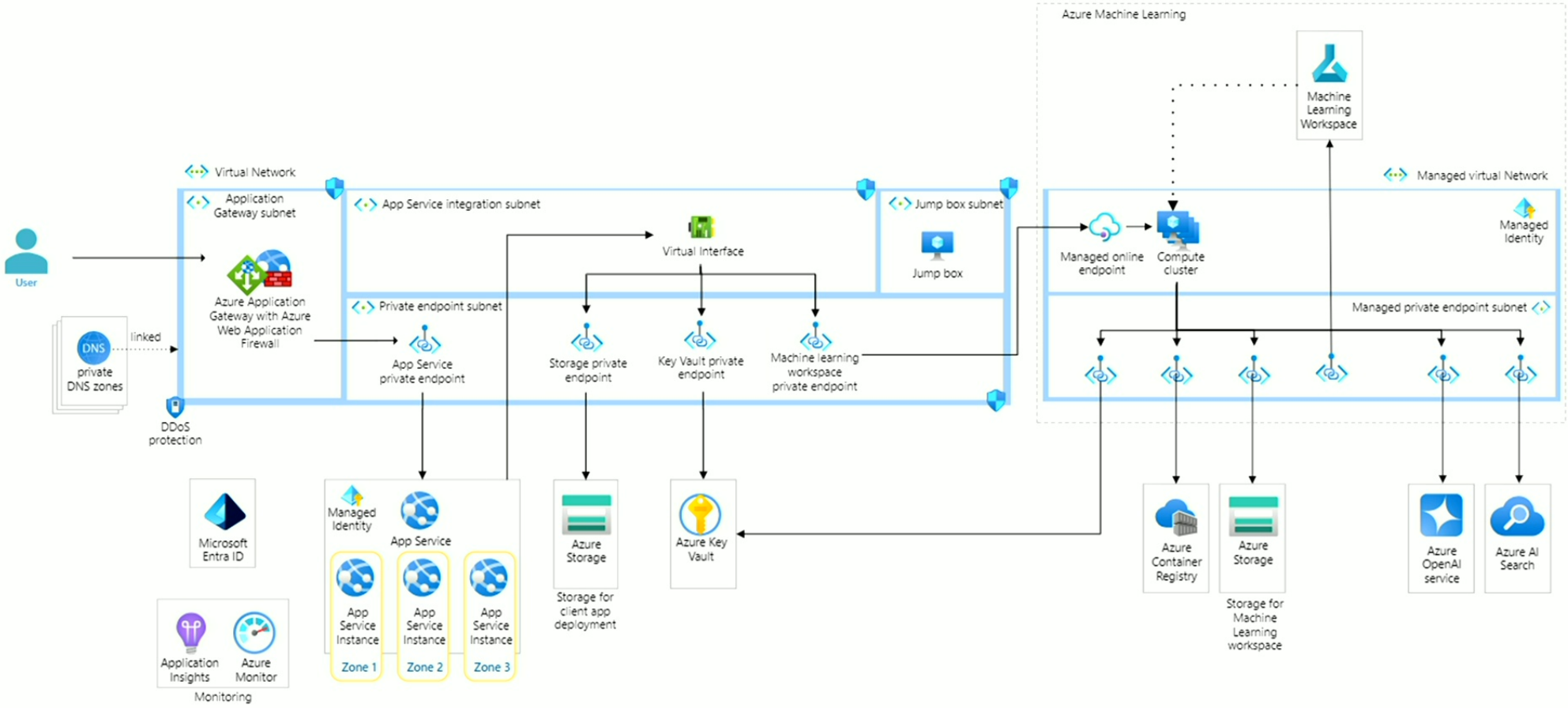
# Architecture – Social media analytics



# Architecture – Open AI chat



# Take-Home Messag

**Things will not happen in a straight line.** Be open to opportunities, to taking risks, to creating an interesting journey for yourself. It's ok to take a wrong turn, to change your mind, to fail.

**Life is a branding exercise.** Discover what you like, what success looks like to you, what you bring to the table, and capitalize on that.

Data science is fun, but **it's not all there is**. There are countless interesting problems to solve outside of DS: DE, MLOps, SA, Gen AI, etc.

If you want to switch to industry, **get started on the cloud**! It's everywhere, and not knowing it can be a hurdle in landing a job.

Technical expertise is important, but **soft skills are even more so**. The best solution has no impact if you cannot communicate it to others.

# Bottom line?

## Our values guide how we work with our clients

We seek to make a genuine impact for our clients and their customers through innovation, and by harnessing the power of people and the Microsoft ecosystem.

We change things for the better

We believe everyone counts

We innovate with passion and purpose

We deliver with excellence

We act with integrity and respect

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# Thank you!

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