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AI for Machines and Business

Alpbacher Technologiegespräche 2017
Upper Austria Breakout Session

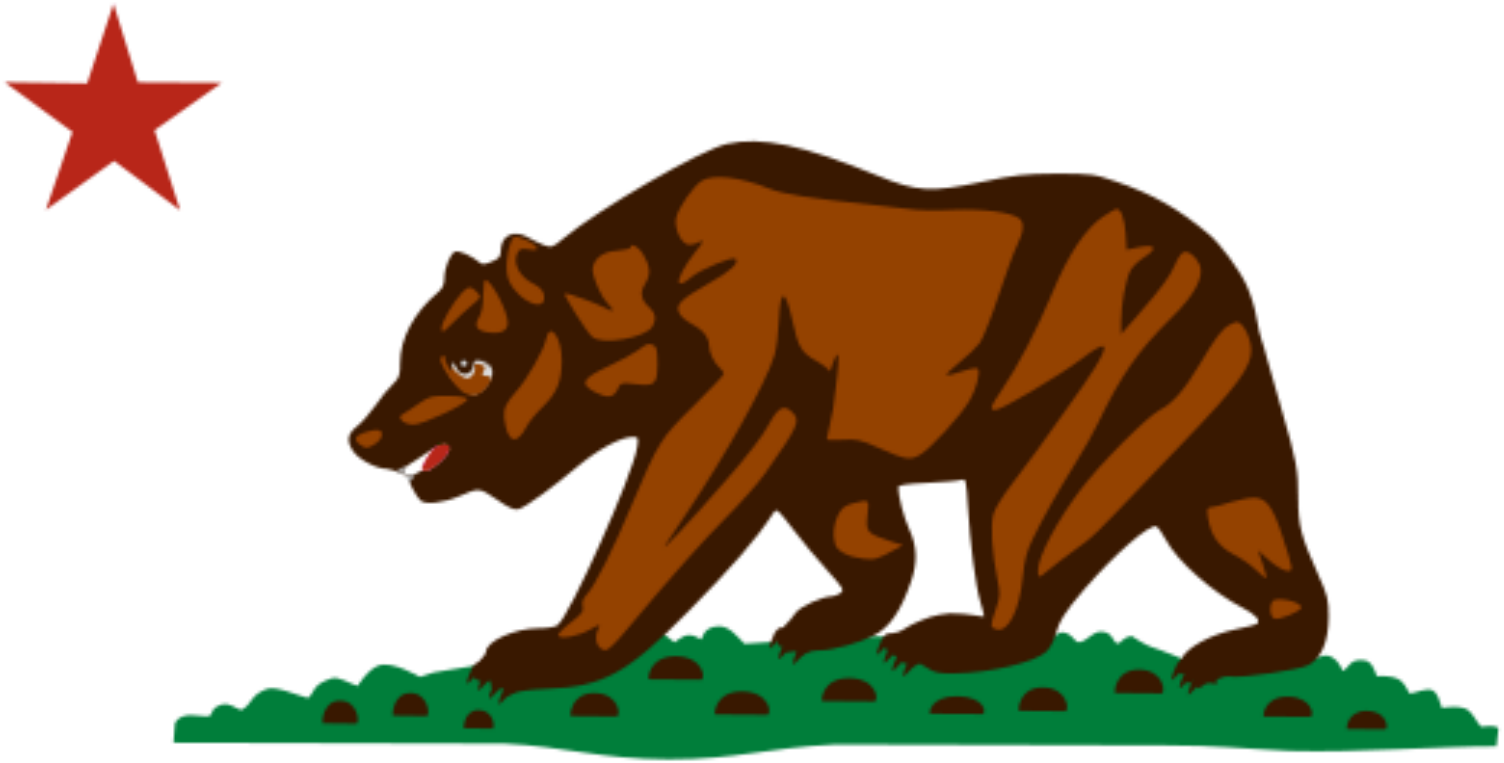
2nd Machine Age: Lernende Maschinen – Autonome Maschinen

Dr. Burton H. Lee PhD MBA
Stanford Engineering | European Entrepreneurship & Innovation
Burton.Lee@innovarium.net | www.StanfordEuropreneurs.org

EUROPEAN FORUM ALPBACH

Freitag, 25. August 2017 | Alpbach AT

business upper austria



CALIFORNIA REPUBLIC

Greetings from Silicon Valley

(and the Republic of California)

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AI UND Data

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WIZARDS UND FABRIKEN

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What are Today's Major AI- & Data-Driven Opportunities & Strengths for Upper Austria to Become a Leading Region for Artificial Intelligence in Europe ??

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What are Today's Major Limiting Factors for Many European Regions To Become Leading Global Centers for Artificial Intelligence Research & Industry ??

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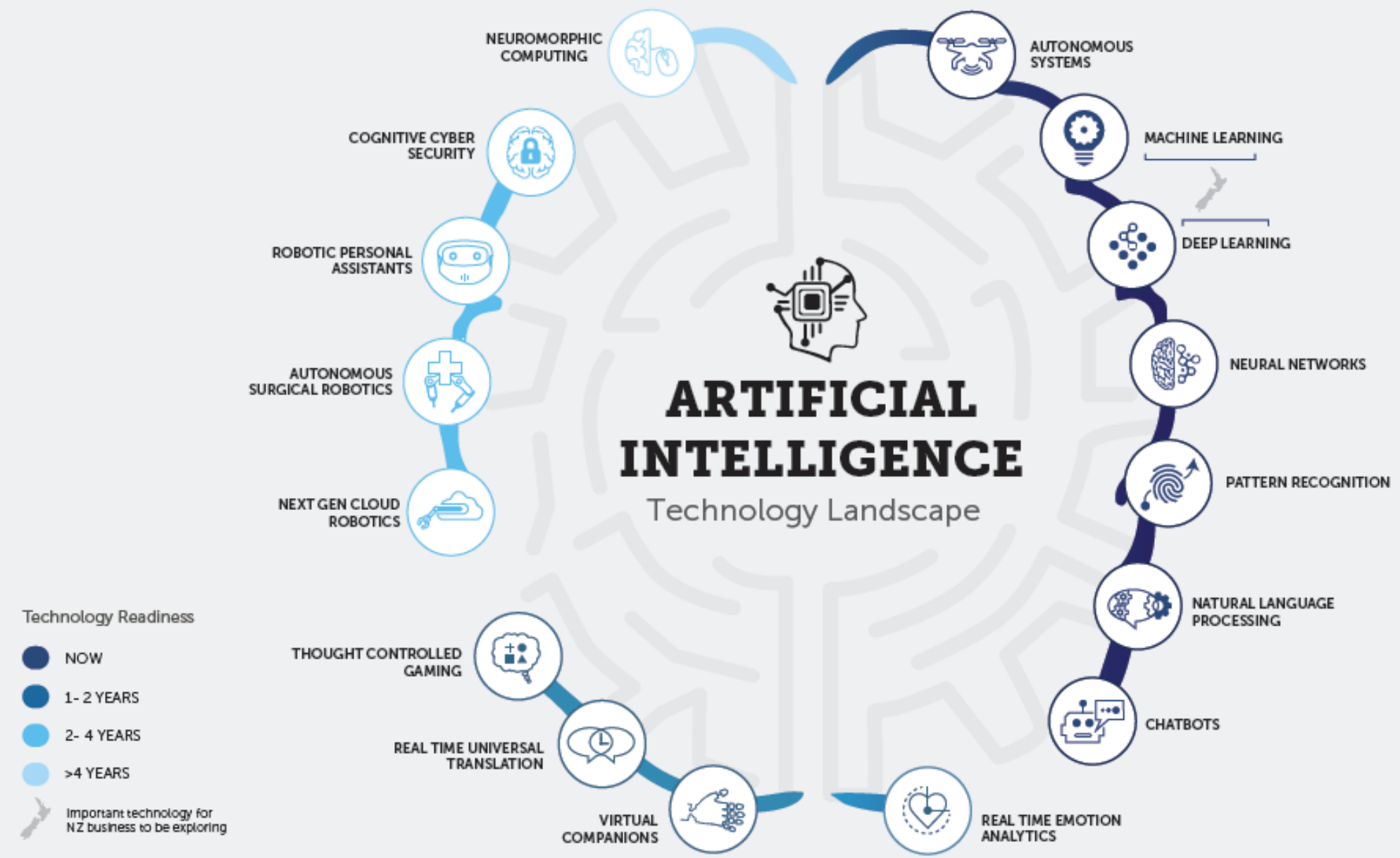
Global Trends in Incorporating AI Technologies in Industry and Society



Sources:
Frost & Sullivan "Artificial Intelligence - R&D and Applications Road Map" (Dec 2016), Harvard Business Review - The competitive landscape for Machine Intelligence (Nov 2016), Shivon Zilis and James Chan "The State of Machine Intelligence, 2016" (2016), Stanford University. "Artificial Intelligence and Life in 2030" (2016), https://en.wikipedia.org/wiki/Artificial_intelligence (2017)

CallaghanIn

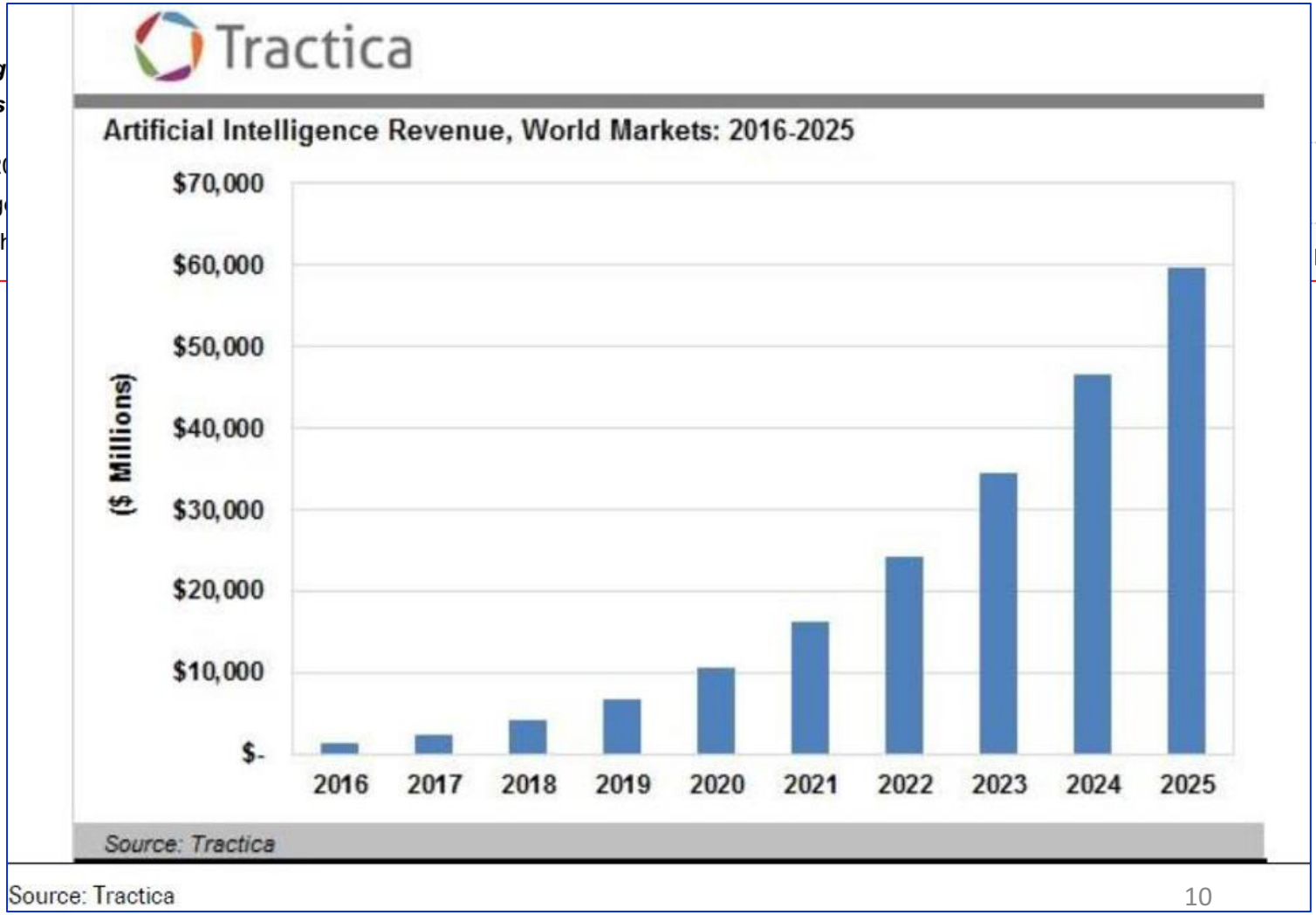
27-JUN-2017 | BY PWC

AI to drive GDP gains of $15.7 trillion with productivity, personalisation improvements

- ***Global GDP will be 14% hig***
- ***Productivity improvements***

Global GDP will be 14% higher in 2
$15.7 trillion. This makes it the bigg
economy according to new research

Dov



Source: Tractica

60+ STARTUPS USING DEEP LEARNING

CORE AI: COMPUTER VISION

clarifai, Tractable, netra, HYPERVERGE, captricity, deepomatic, sentient, Sighthound, terraloupe, imagenii, pilot.ai

CORE AI: OTHER

TERADEEP, affectiva, Wave Computing, DigitalGenius, LEAPMIND, Arya, HEURO, twentybn

BI, SALES & CRM

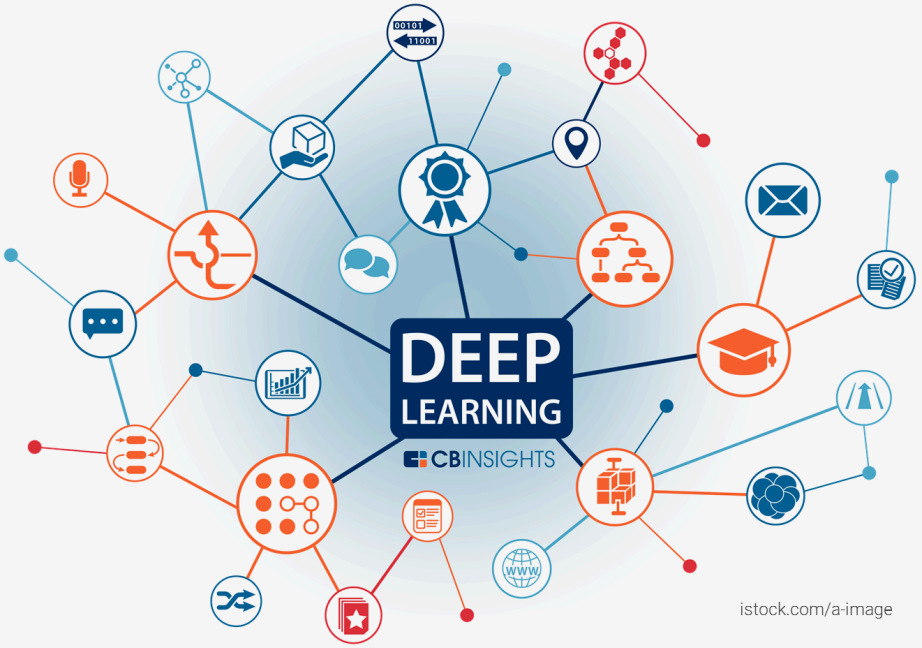
SKYMIND, TalkIQ, intranetum, ripjar, FRACTAL INDUSTRIES, MARIANA, DEEPGRAM, True AI, KOVID, ditto, Gridspace

CORE AI: VOICE INTERFACE

VIV, Mobvoi 出门问问, MaluubA, OBEN

ROBOTICS & AUTO

netradyne, AdasWorks, drive.ai, Rokid, 图灵机器人 TURING ROBOT, comma.ai



istock.com/a-image

E-COMMERCE

Reflektion, CORTEXICA, VISENZE, STAQU

ACQUIRED

(2014-2016YTD)

Etsy Blackbird, a Orbeus, IBM AlchemyAPI, intel Movidius, nervana SYSTEMS, Perceptio, vocaliq, turi, DEEPMIND, DNNresearch, Dark Blue Labs, Vision Factory, MAGIC PONY TECHNOLOGY, MADBITS, salesforce MetaMind

HEALTHCARE

imagia artificial intelligence against cancer, Mindshare MEDICAL, BAYLABS, INSILICO MEDICINE, BUTTERFLY Network, Inc., deep genomics, Atomwise Better medicines faster., zebra MEDICAL VISION, PATHWAY GENOMICS, AVALON AI, Behold.ai, deep genomics, Transpiring Innovation ADVENIO, enlitic, Lunit, SIGTUPLE, MedyMatch

SECURITY

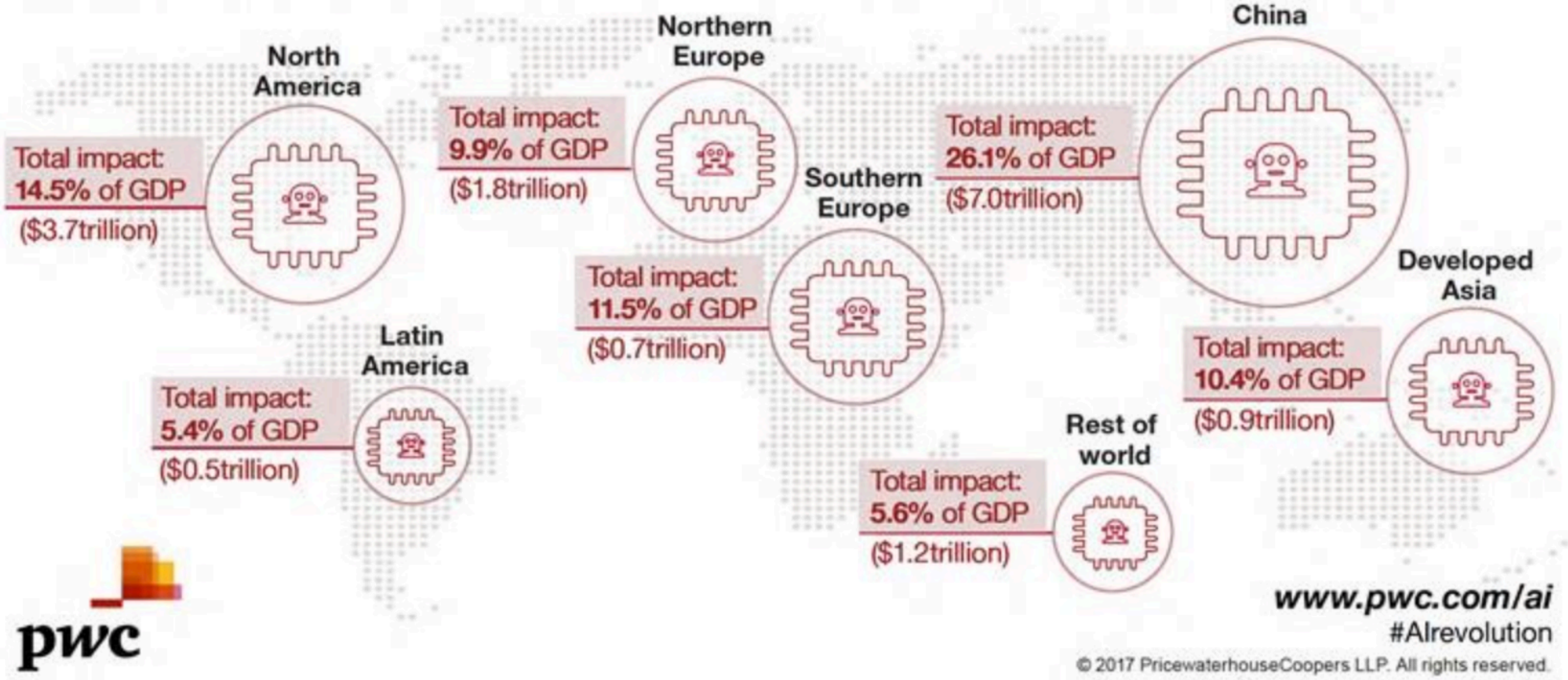
deepinstinct, UMBO CV, signalsense

OTHER

Alpaca, indico, Iris Automation

CBINSIGHTS

Sizing the prize – Which regions gain the most from AI?



pwc

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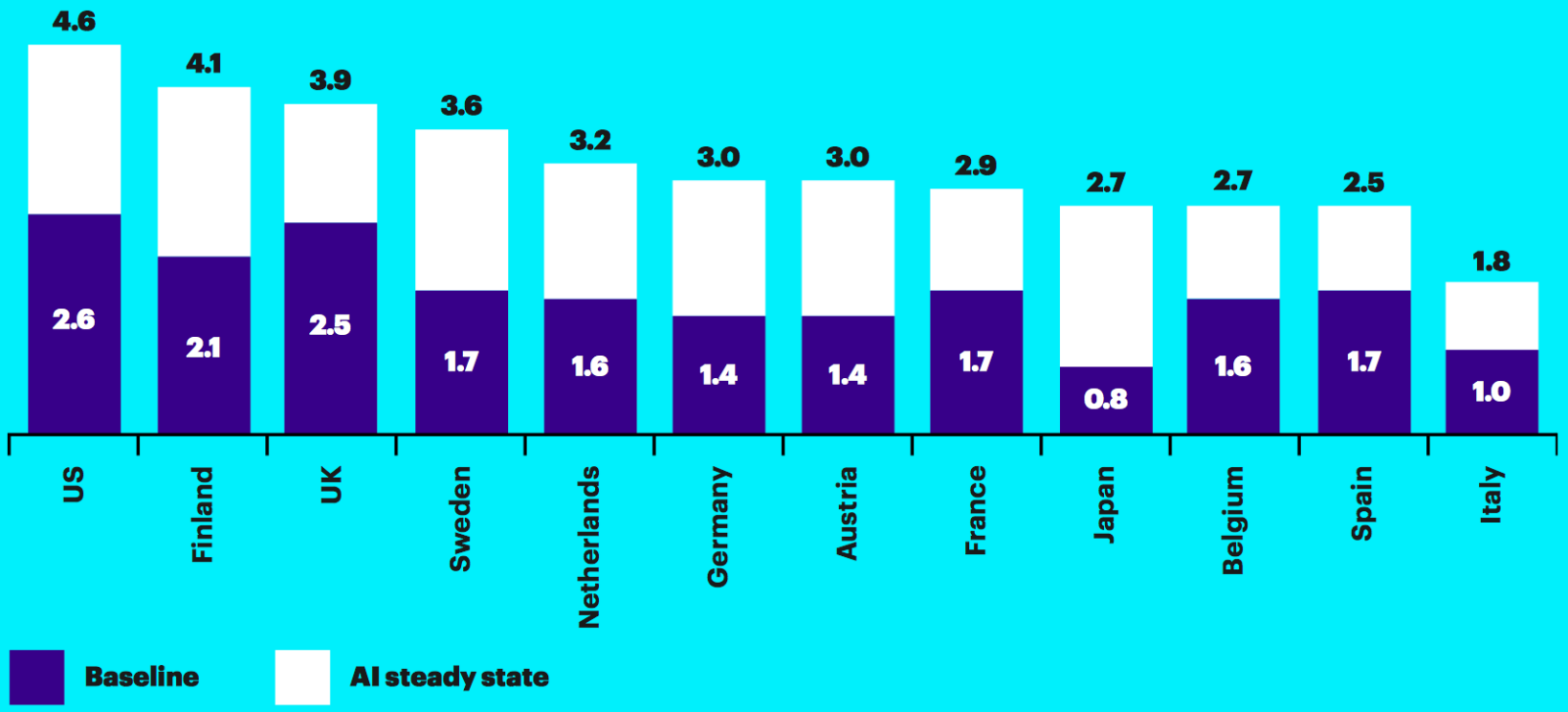
Figure 2. The economic impact of AI on countries: Our modeling shows that AI has the potential to double growth rates in the 12 countries that we analyzed.

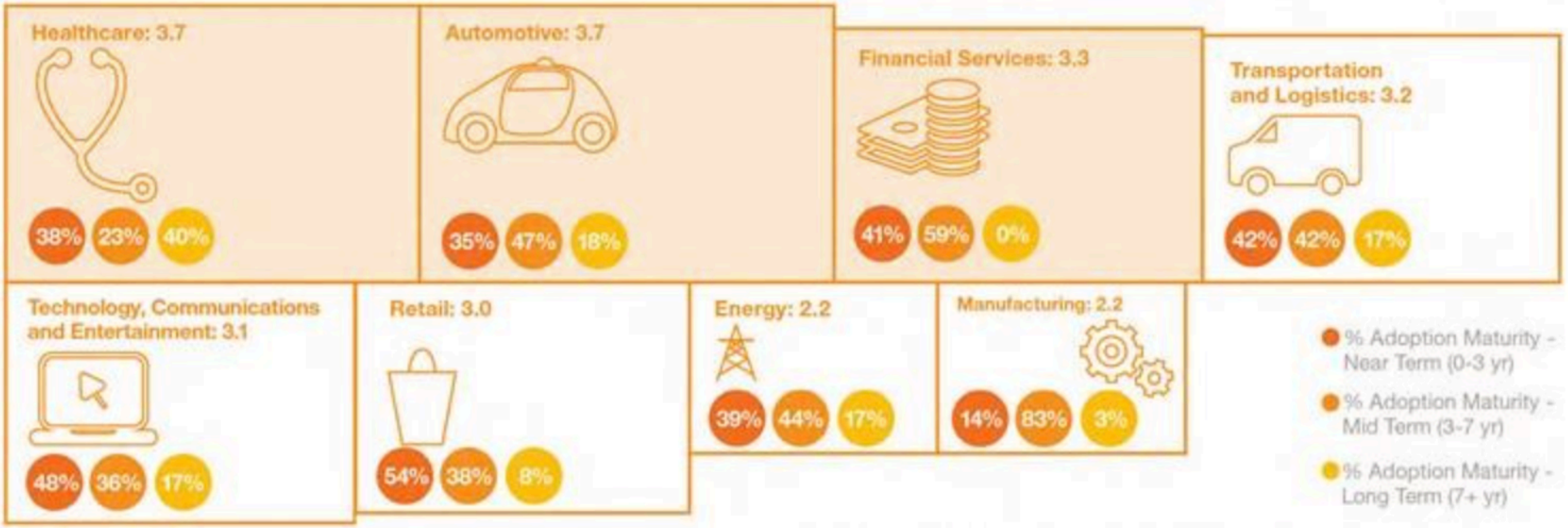
Annual growth rates by 2035 of gross value added (a close approximation of GDP)



Source: Accenture and Frontier Economics

25 Aug 2017

Sizing the prize – What's the potential for AI to impact your sector?



Scores based on PwC's AI Impact Index evaluation. Potential scores range from 1-5, with 5 indicating the highest potential impact due to AI, and 1 being the lowest.

pwc

www.pwc.com/ai

#AIrevolution

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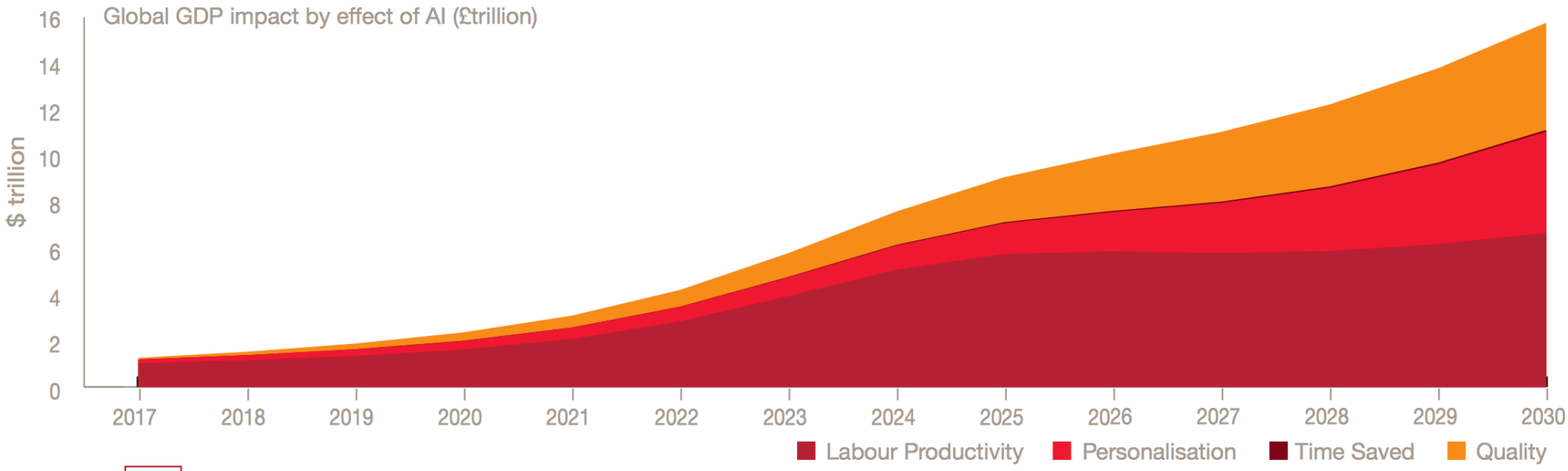
Figure 1: Where will the value gains come from with AI?



Labour productivity improvements are expected to account for over **55%** of all GDP gains from AI over the period 2017 – 2030.

As new technologies are gradually adopted and consumers respond to improved products with increased demand, the share of impact from product innovation increases over time.

58% of all GDP gains in 2030 will come from consumption side impacts.

Source: PwC analysis

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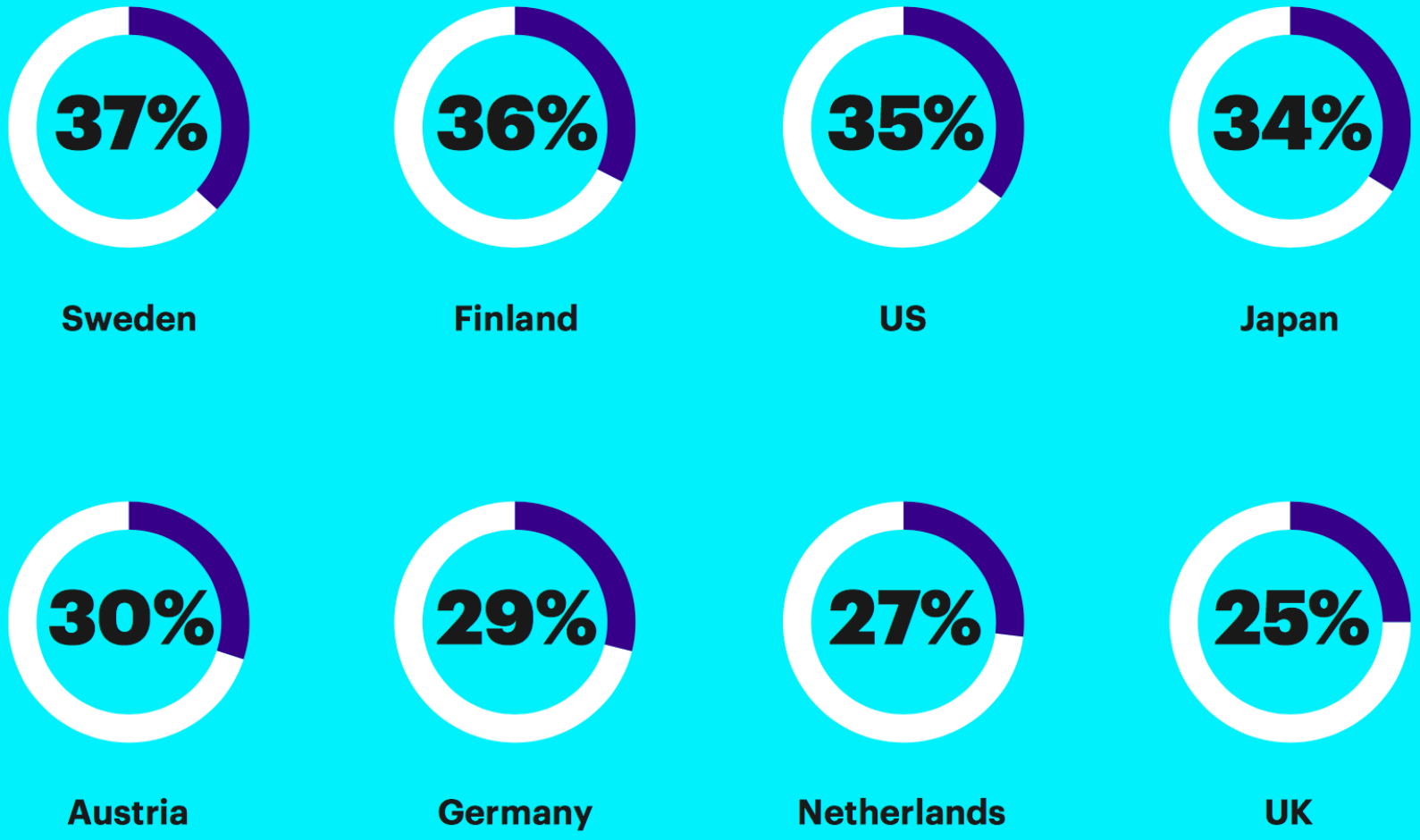
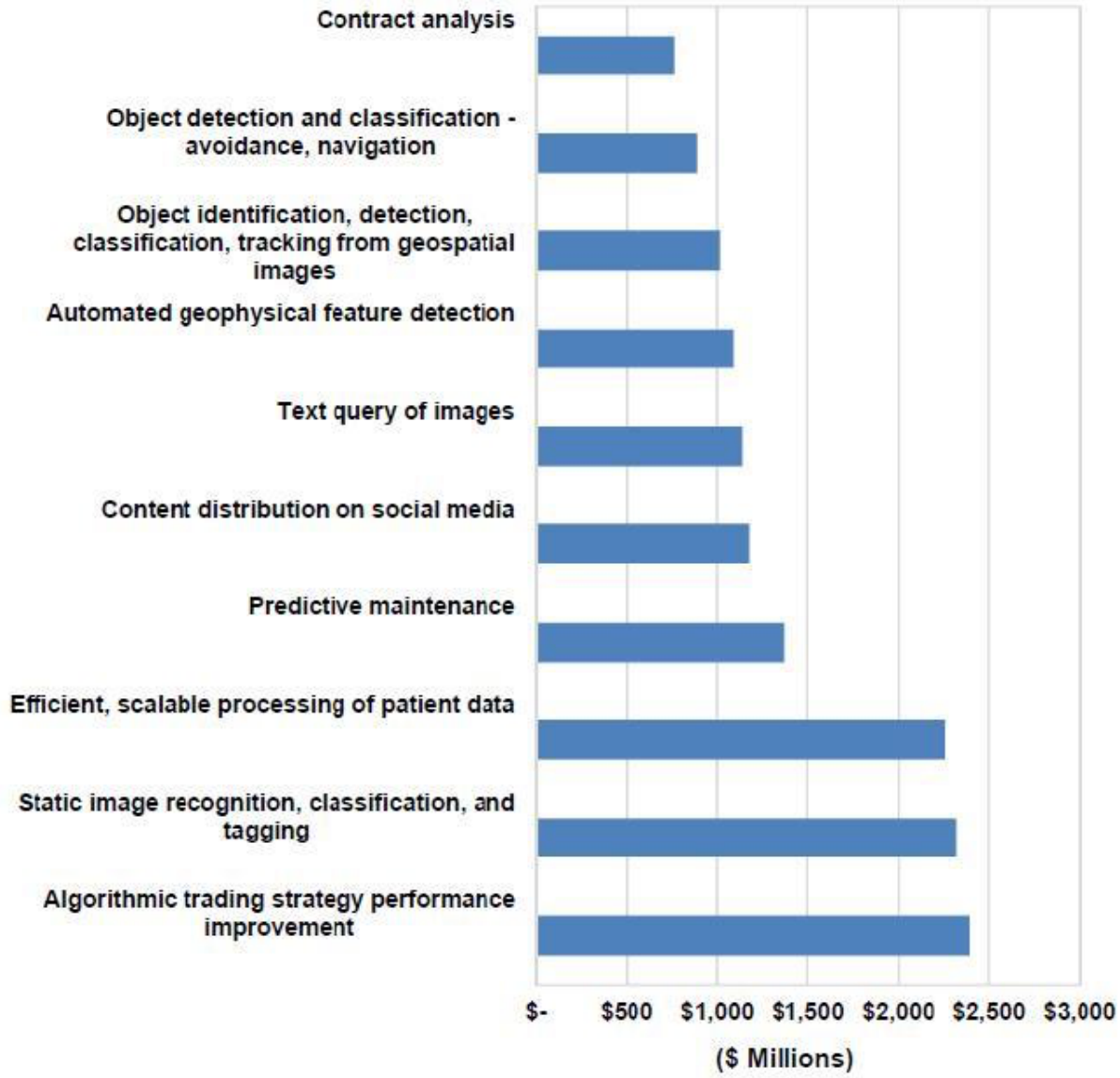
Figure 3. Labor productivity in an AI world: AI promises to significantly boost the productivity of labor in developed economies.

Percentage difference between the baseline in 2035 and AI steady state in 2035.

Source: Accenture and Frontier Economics



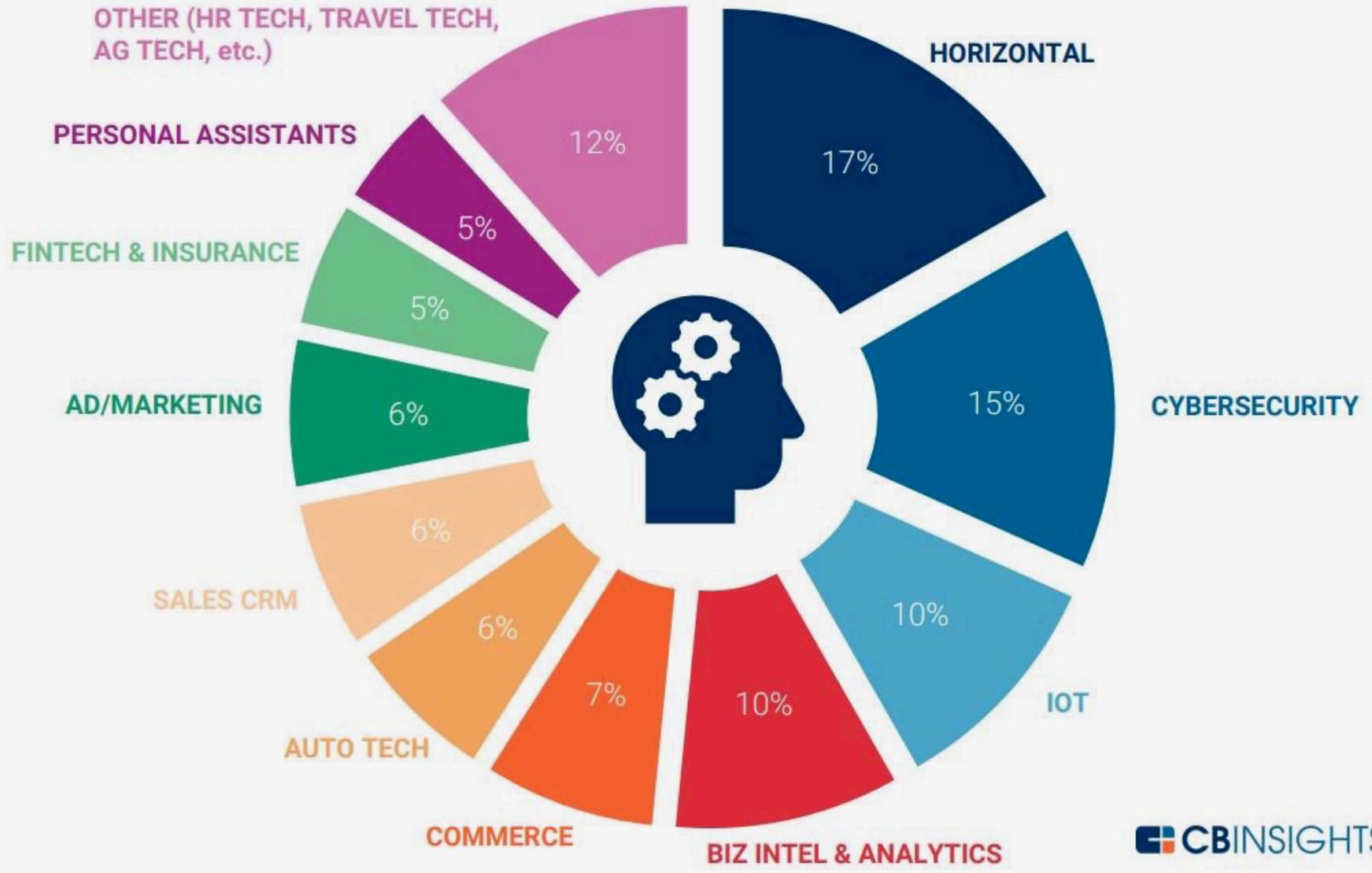
Artificial Intelligence Revenue, Top 10 Use Cases, World Markets: 2025



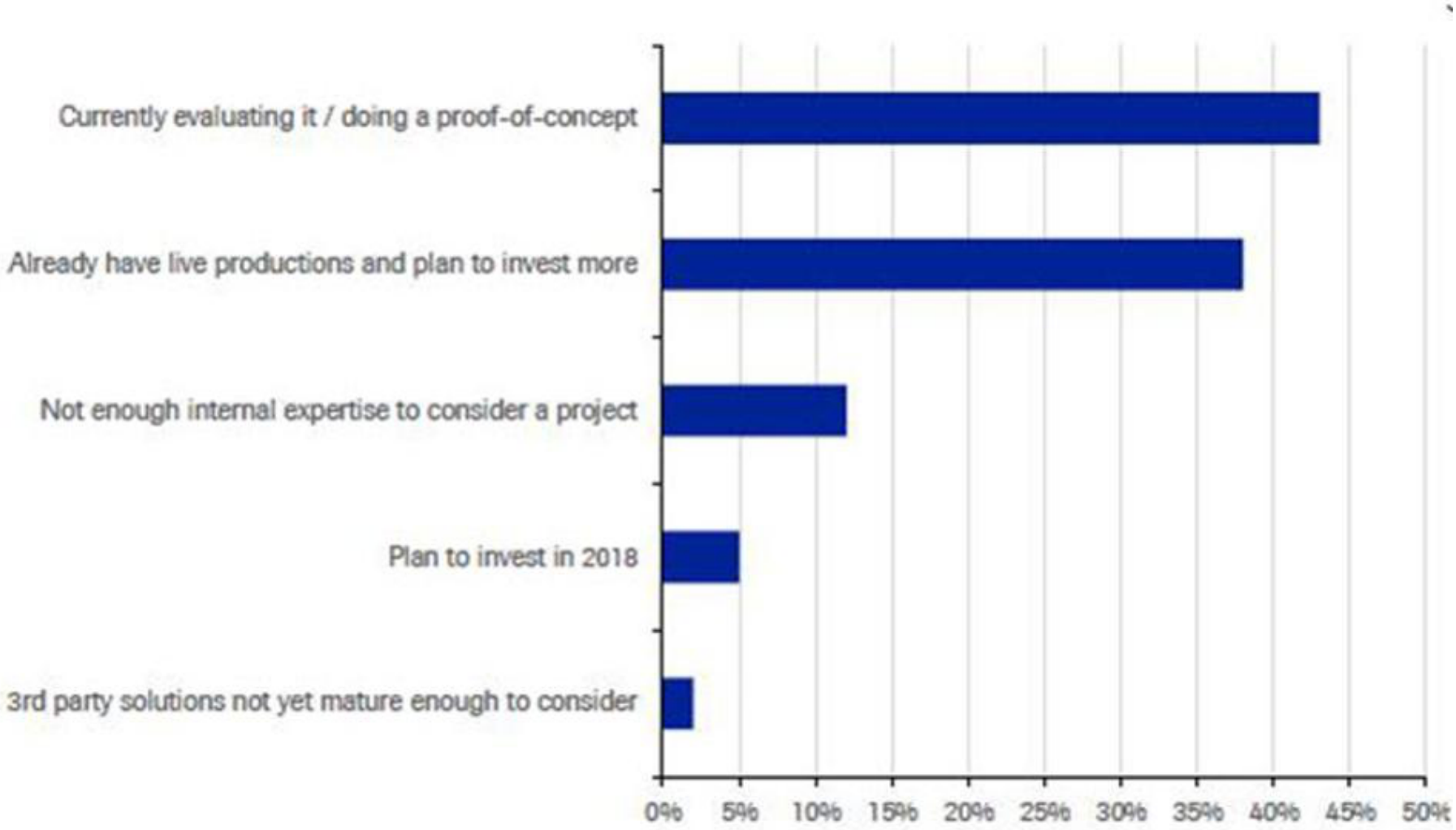
(Source: Tractica)

CVC DEAL SHARE INTO ARTIFICIAL INTELLIGENCE SUB-SECTORS

2012 – 2017 (H1'17)



How would you characterize your company's readiness for machine learning and artificial intelligence projects?



Source: Cowen and Company IT Survey May 2017 (N= 146)

Lessons from

Facebook Applied Machine Learning Group

for Upper Austria

facebook research Research Areas Publications People Programs Downloads Careers Blog

Applied Machine Learning

Applying machine learning science to Facebook products

Machine learning is essential to Facebook. It helps people discover new content and connect with the stories they care the most about. Our applied machine learning researchers and engineers develop machine learning algorithms that rank feeds, ads and search results, and create new text understanding algorithms that keep spam and misleading content at bay. New computer vision algorithms can “read” images and videos to the blind and display over 2 billion translated stories every day, speech recognition systems automatically caption the videos that play in your news feed, and we create new magical visual experiences such as turning panorama photos into fully interactive 360 photos.

Established 2010

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How
Joaquin Candela, Head - AML Group, built an ‘AI factory’ inside Facebook

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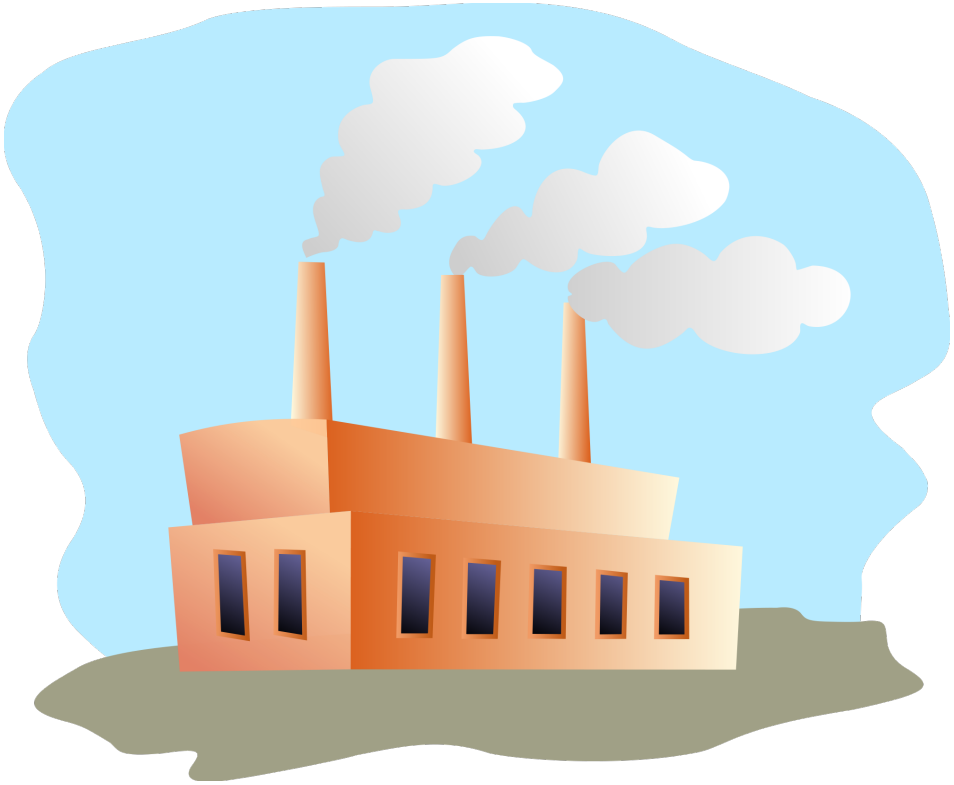
Scaling AI/ML/DL Across the Upper Austria Industry & Business Ecosystem
Lessons from Facebook

AI 'Wizards'
(Not Scalable)



AI 'Factory'
(Scalable)

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ON ‘WIZARDS’:

“Computer scientists, especially academic-minded ones, are rewarded for inventing new algorithms or improving existing ones.

A better statistical model is the goal. Getting cited in a journal is validation. Wowing your peers gives you cred.”

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“I am concerned about the ‘If you build it, they will come’ phenomenon.”

‘Just creating bits of artificial intelligence in the hope that people will see the value and adopt it doesn’t work.’

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Figure out the impact on the business first.

Know what you're solving for.

Know what business challenge you need to address.

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How Candela built his AI factory inside Facebook…

"The key, Candela says, was figuring out where on the product development path AI fits."

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By 2015 … Candela was still worried about the "build it and they will come" phenomenon, so he focused less on how his team would be structured and more on ***how the group would connect to the rest of Facebook***.

"You build a factory that makes amazing widgets, and you forget to design the loading docks into your factory?" He laughs. "Well, enjoy your widgets."

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Where AI Fits In at Facebook

SCIENCE
R&D TEAM

PRODUCT
TEAMS

H3
R&D

H2
AML

H1
Product delivery

Transferring the Science into the Product

PRODUCT READINESS

TIME

SOURCE FACEBOOK

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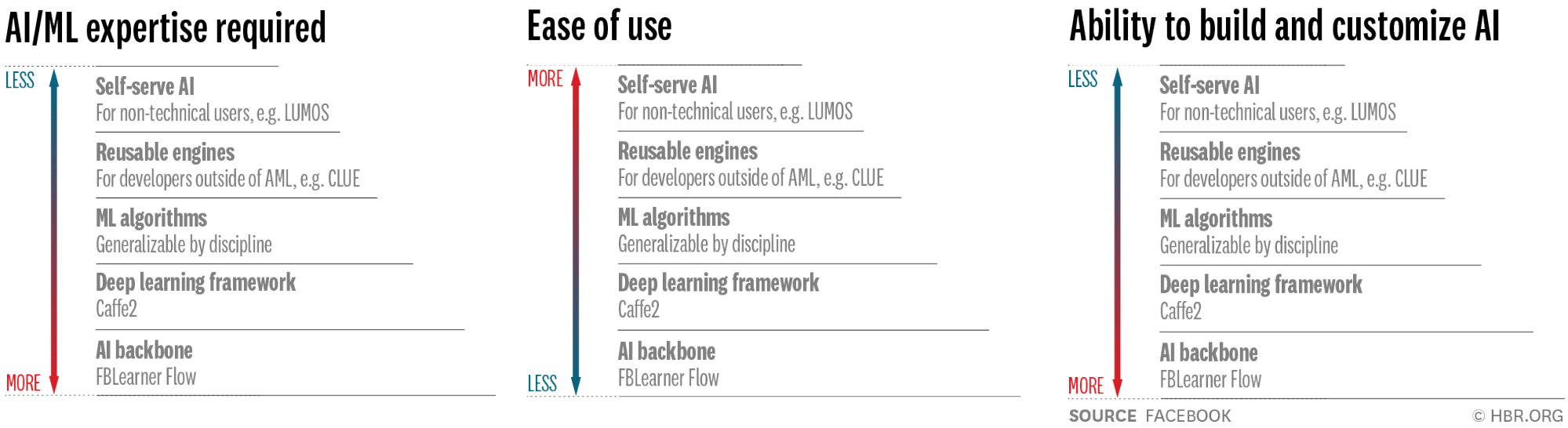
THE AI FACTORY
Building Multiple Channels for Scaling AI Into the Product Groups



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Candela's team …

"… a factory of specialists who translate others' science for others' products - and fail half the time."

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Focus on the Data !!

Joaquin Candela, Head of AML:

"To get more value, I can do three things," he says. "I can **improve the algorithm** itself, make it more sophisticated. I can **throw more and better data** at the algorithm so that the existing code produces better results. And I can change the **speed of experimentation** to get more results faster.

"We focused on <u>data</u> and <u>speed</u>, not on a better algorithm."

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"… for a company, a good algorithm that improves the business is more valuable than vanguard statistical models."

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“I’m not saying don’t work on the algorithm at all.

I’m saying that focusing on giving it more data and better data, and then experimenting faster, makes a lot more sense.”

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‘It requires a shift in thinking to get those engineers to focus on business impact before optimal statistical model.

Candela thinks many companies are making the mistake of structuring their efforts around building the best algorithms, or hiring developers who claim to have the best algorithms, because that’s how many AI developers think.’

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So rather than defining success as building the best natural language processing algorithm, he defines it as deploying one that will help users find a restaurant when they ask their friends, "Where can I get a good bite around here?"

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IT'S ALL ABOUT THE DATA !!

Candela :: '[In some cases] You don't need machine learning. You need to build a data science team that helps you think through a problem and apply the human litmus test. Sit with them.'

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IT'S ALL ABOUT THE DATA !!

'Look at your data…

If you can't tell what's going on, if you don't have any intuition, if you can't build a very simple, rule-based system — like, *Hey, if a person is younger than 20 and living in this geography, then do this thing* — if you can't do that, then I'm extremely nervous even talking about throwing AI at your problem.'

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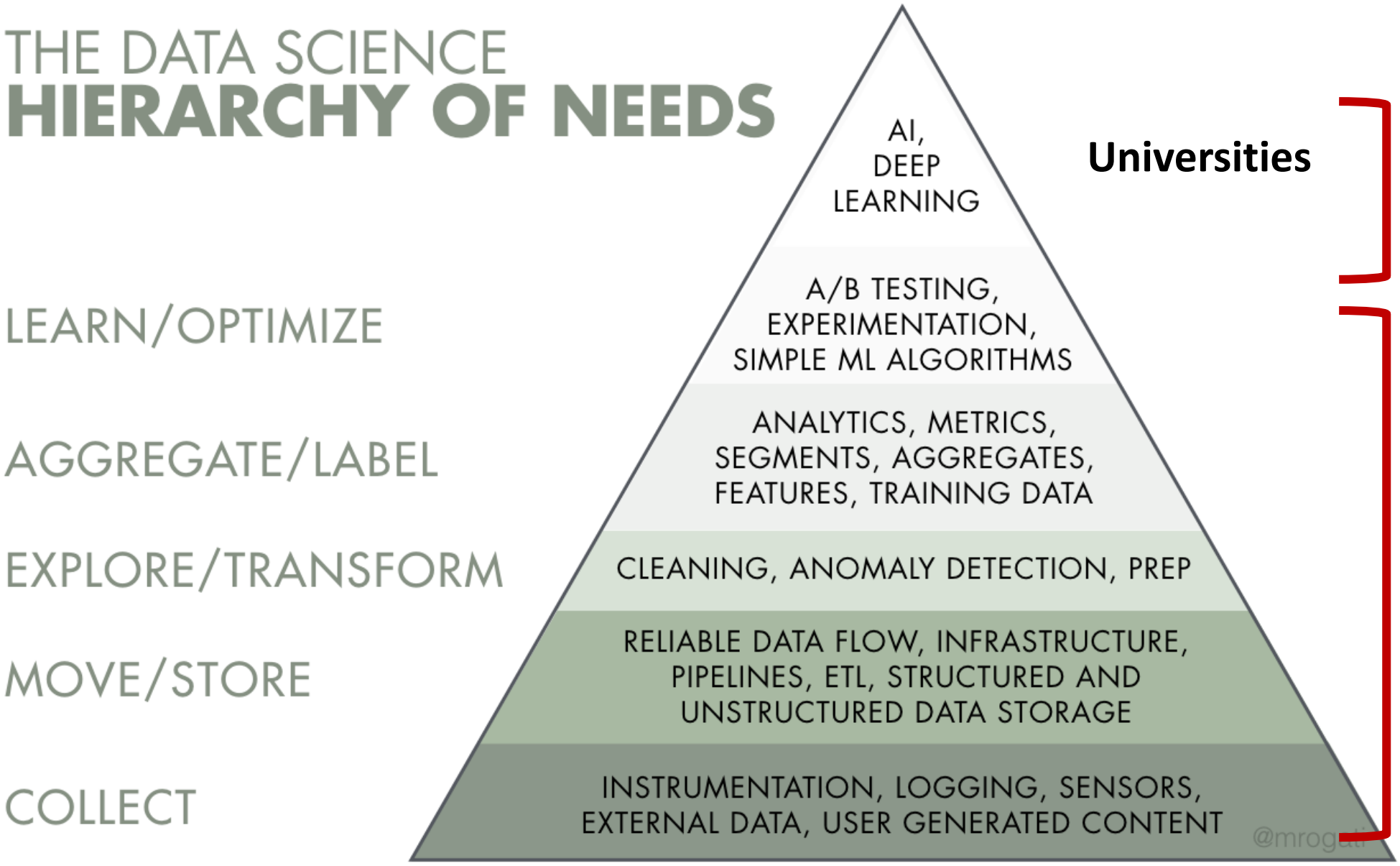
What OÖ Companies Need to Put In Place In Order To Be Ready for AI/ML/DL



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Upper Austria Needs to Bring ‘Data’ Explicitly into the AI Discussion and Strategy

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Key Company Competencies:

Chief Data Officer
Data Management
Data Handling Processes
Data Generation & Cleaning
Data Storage
Data Ownership & Legal
Data Culture in Enterprises

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Key Academic Groups:

Informatik (Computer Science)
Datenwissenschaften (DS)
Management & Business
Entrepreneurship & Design

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AI + Data

Ecosystem, Strategy & Roadmap

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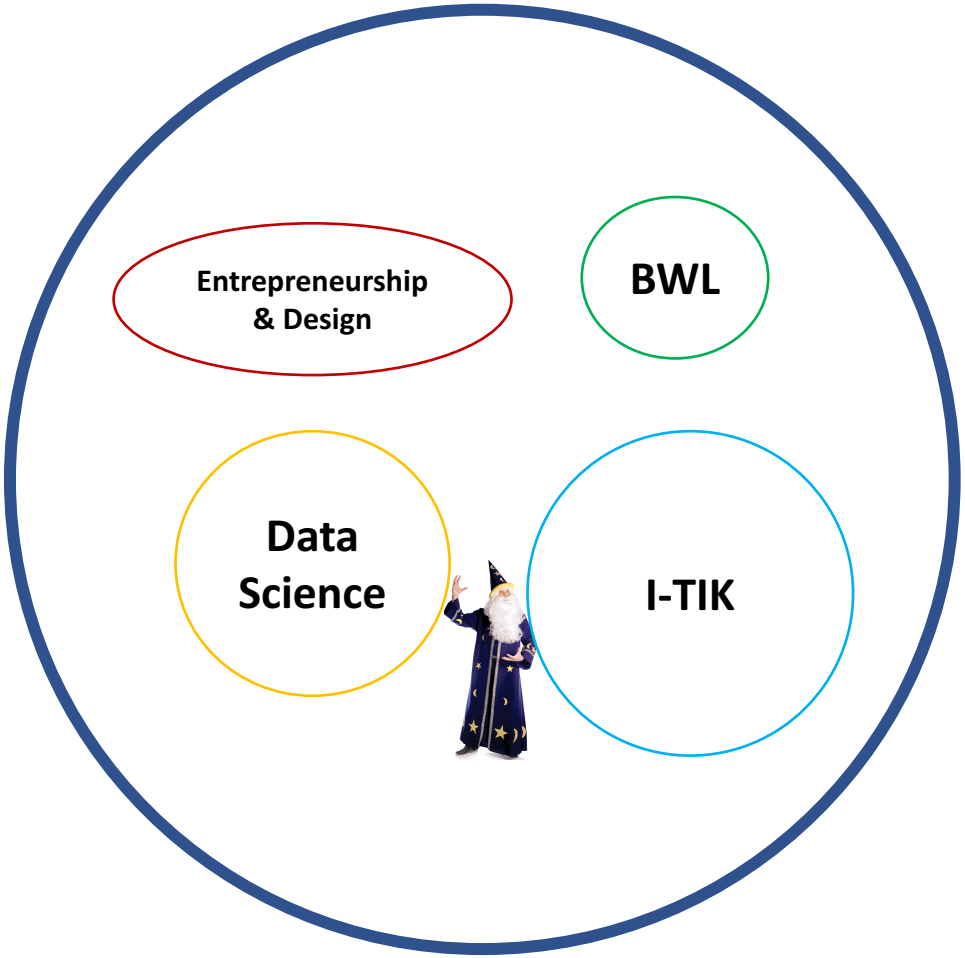
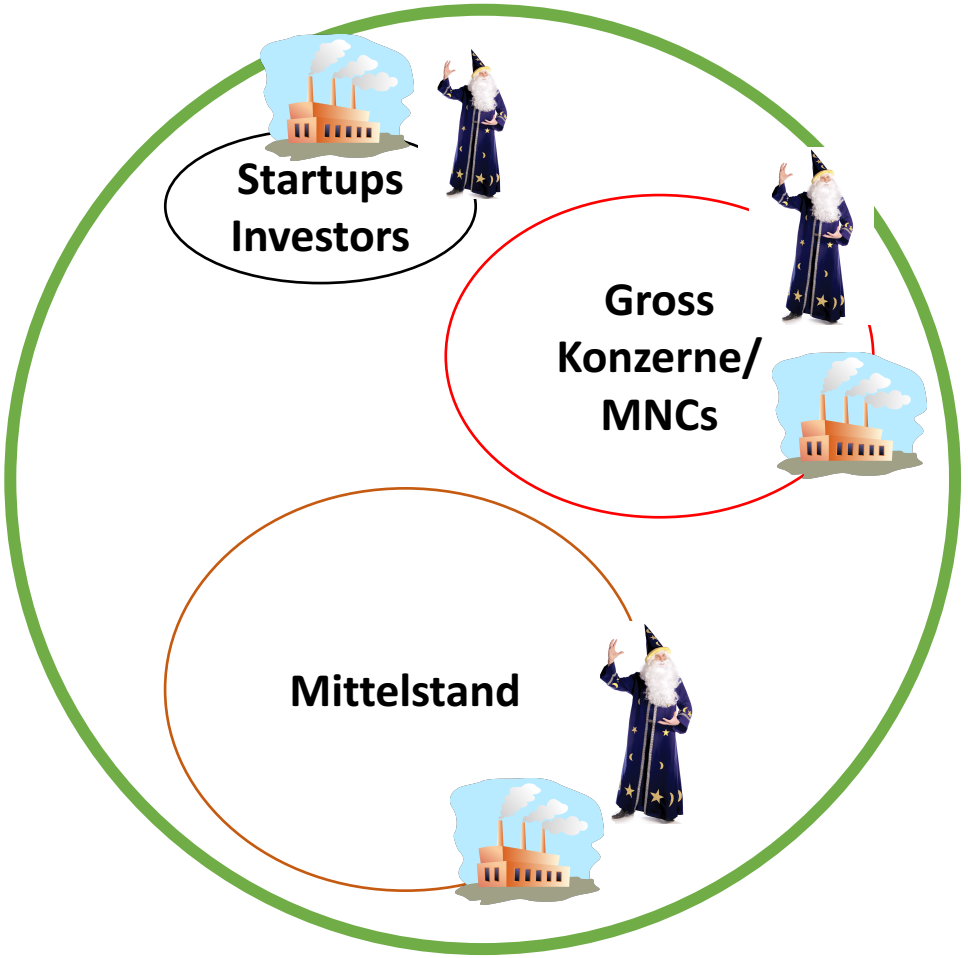
A Healthy & Mature [AI + Data] Ecosystem





Oberösterreich :: A Region of 'AI Wizards' and 'AI Factories'

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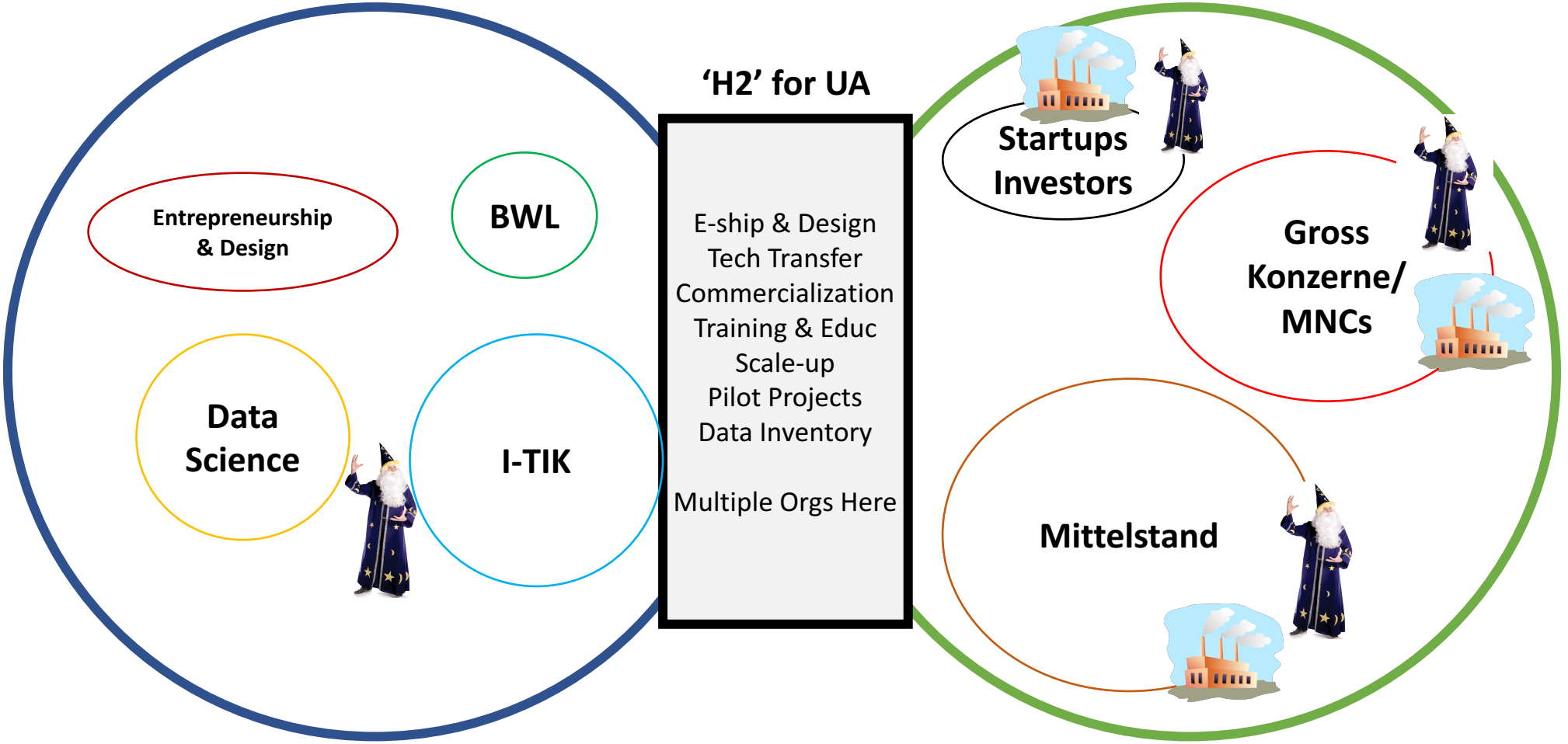
A Healthy & Mature [AI + Data] Ecosystem



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Successful Regional Growth Strategies

Also Require Attention to the

‘Demand Side’ of Innovation

How Do We Make UA

a ‘Sticky Region’ ??

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How Do We

Attract and Keep

the Best Talent in OÖ ??

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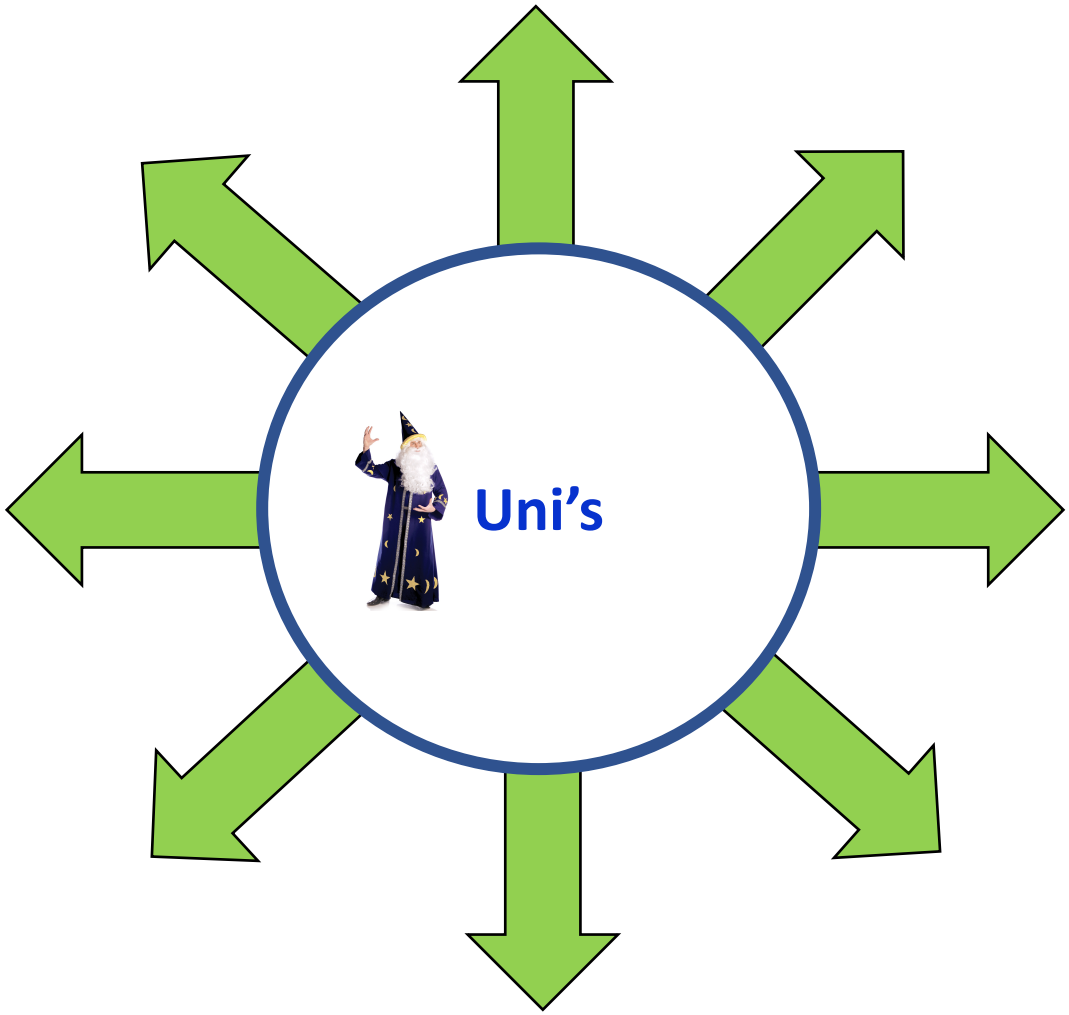

Supply of AI Resources

Innovation 'Push' (Supply Side):

Universities that Pursue Excellence in AI/DS/CS Research Relevant to Industry Needs – and that Also Create Intellectual Property & Educate Future Entrepreneurs – Are Essential to Future AI-Driven Growth in OÖ

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Es Geht Aber
Nicht Nur Um Forschung !!

(Its Not Just About Producing Research Results …)

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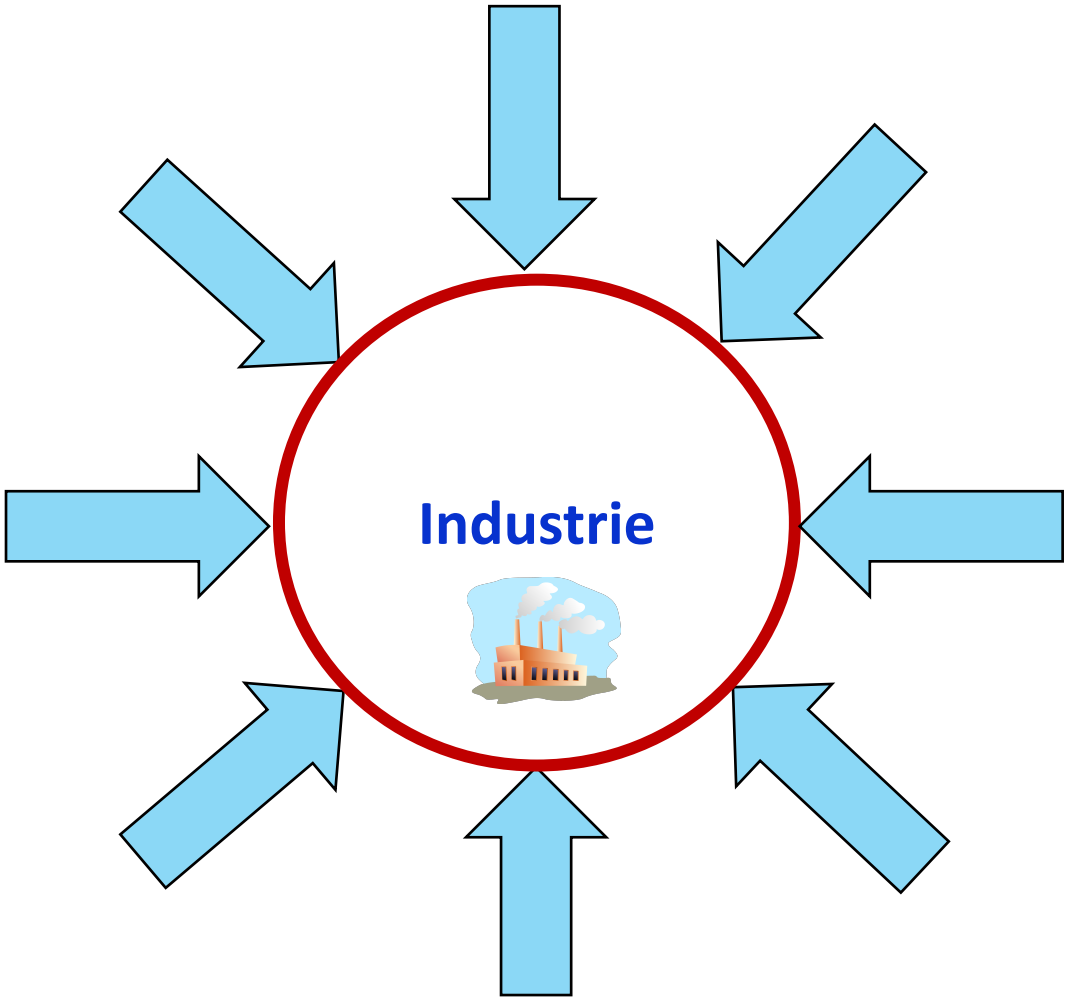
Innovation 'Pull' (Demand Side):

AI-Based Growth in OÖ is also Highly Dependent on the Speed, Breadth & Depth of Enterprise Adoption of AI + Data Technologies, Business Models & Culture in the Region



Demand for AI Resources (Industry Adoption)

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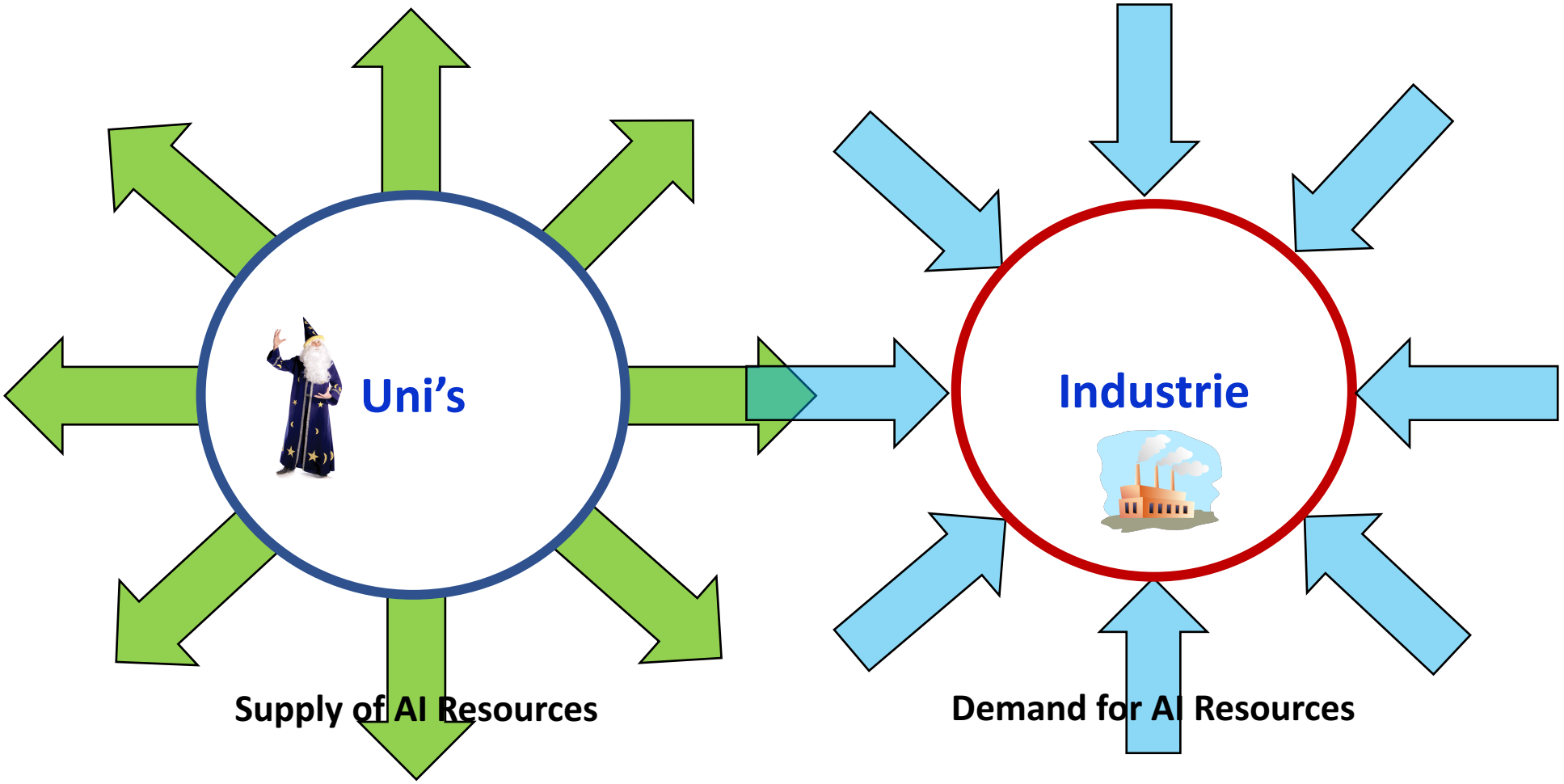
Both of These – 'Push' + 'Pull' - Working Together, Are Necessary to Make AI a Driver of Economic Growth in UA



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So, How Do We

Attract and Keep

the Best Talent in OÖ ??

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Widespread Industry Adoption of
AI- & Data-Derived Technologies, Products,
Services & Business Models

– Alongside a Dynamic Innovation &
Entrepreneurship Ecosystem in the Region –

Are Critical to
Making OÖ 'Sticky' and Attractive

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Making Oberösterreich 'Sticky' Through Demand-side Strategies

* AI-Supported Entrepreneurship & Product Development
(Consumer Software, Enterprise Software, Gaming, MedTech, IoT)

* Interesting Cutting Edge AI-based Projects at Local Companies
(System Diagnostics, Process Efficiency, Customization, usw usf)

* Availability of Interesting Heterogeneous Datasets from Industry & Public Sector
(that can be used in theoretical & applied research projects)

* A Community of Enterprises and Public Organizations that are 'Data-positive' and Innovative
(are open to sharing datasets with external parties in structured collaborations, are adopting improved data-centric business practices, policies & culture)

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Industry Adoption (or Lack Thereof) of Data-centric Management Mindsets, Practices, Processes and Culture Can Be THE Major Factor Limiting – or Enabling – Regional AI-Driven Economic Growth

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Forschung Steht
*Am *Anfang* der KI-Wertkette …*

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…und Nicht
*Am *Ende* der KI-Wertkette*

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Endziel:

Schöpfung eines nachhaltigen KI- und Datenökosystems in Oberösterreich

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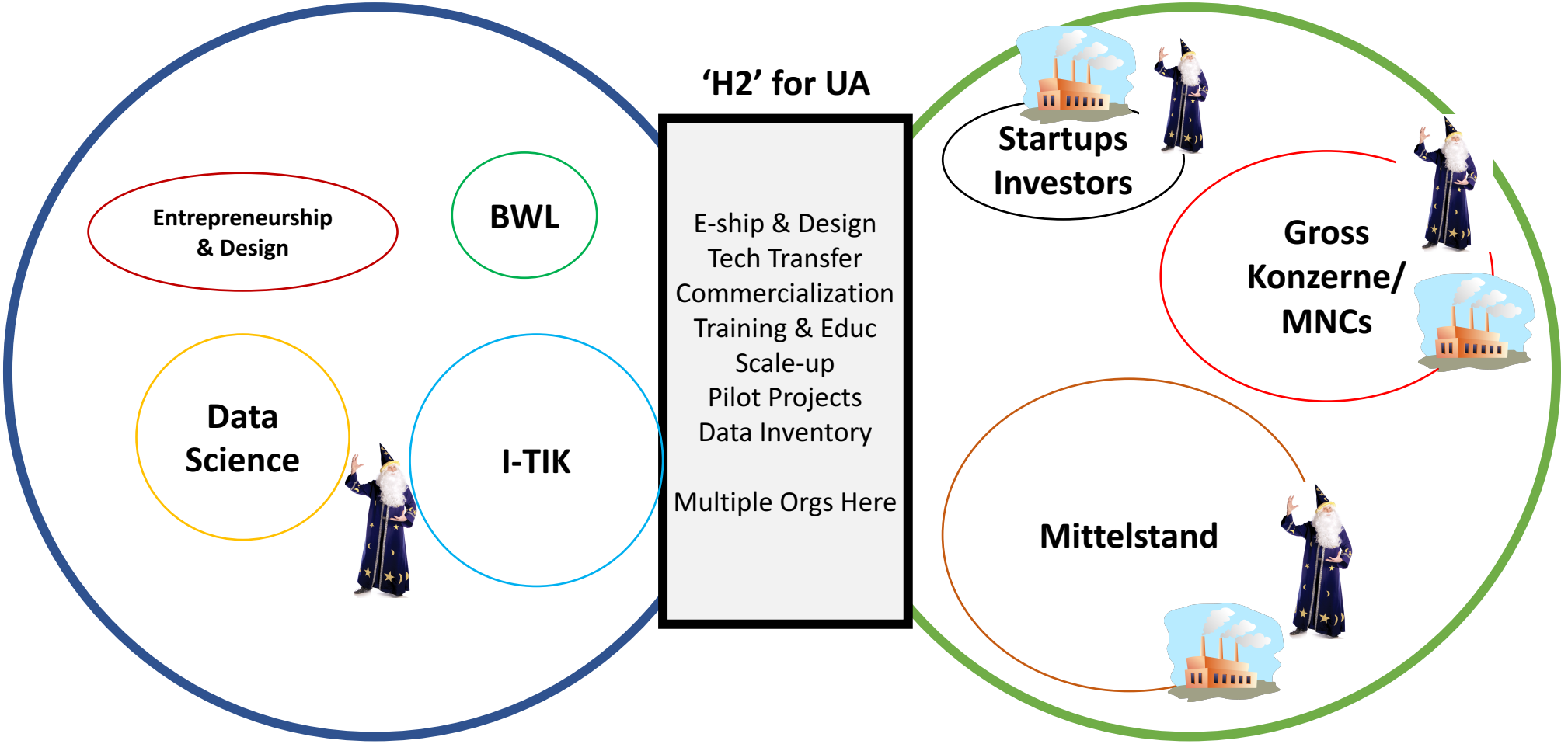
A Healthy & Mature [AI + Data] Ecosystem



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Build on Existing Strengths

(Produktion, Logistik, MaschinenbauKultur, Industrial Products)

AND

Concurrently Develop Critical New Strengths

(Computer Science, Software Engineering, AI,

Data Science, Data Management & Culture, Consumer, MedTech)

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DANKE !!

INNOVARIUM VENTURES

Working in Silicon Valley, Europe, Latin America and Washington DC

- Senior financial, technical and strategy advisory services for global technology innovation organizations
- Professional Services
  - Technology startup and growth companies
    - Interim CXO and Advisory Board roles
    - Expert guidance & decision-making at the interface between market/customers, technology and finance
    - Business development – industrial and government
    - Business plan preparation/research/review; Government Grant proposal preparation/review
    - Coaching and mentoring of CEOs and other CXO-level managers
    - Assistance with government regulatory and policy agencies
  - Angel, venture capital and private equity Investors
    - Fund strategy, team selection and market positioning
    - Due diligence: technical, financial, strategy and business models
  - Public and non-profit R&D laboratories
    - Technology transfer & partnerships; venturing and spin-out of companies; strategy and business development; grant applications
  - Research universities
    - Innovation-related models, policies and practices
    - Technology transfer and licensing; industry partnerships and relations; development and strategy; grant applications
  - National and regional government agencies
    - Innovation policy formulation, analysis and review; cluster development strategy; economic impact studies
    - Science & technology policy formulation, analysis & review: space, aviation, nanotechnology, software/AI/robotics, manufacturing
- Selected recent clients
  - US/European technology startup companies – alternative energy, robotics/AI, software, Internet, nanotech
  - Venture and private equity funds – aerospace, nanotechnology, ICT, computing, advanced materials, clean tech
  - Office of the Prime Minister, Ireland; European Commission; National Science Foundation; NASA, National Academies
- **Dr. Burton Lee PhD MBA, Managing Director**
  - Contact: Burton.Lee@innovarium.net Based in Palo Alto, CA near Stanford University
  - Bio/References: LinkedIn Profile
  - Lecturer, European Entrepreneurship & Innovation, Stanford School of Engineering

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