ARTIFICIAL INTELLIGENCE AND INTELLECTUAL PROPERTY LAW IN THE AGE OF DIGITIZATION

2ND ONLINE SESSION (SEPTEMBER 13, 2021, 3PM): TECHNICAL AND ECONOMIC BACKGROUND

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ECONOMIC SIGNIFICANCE OF THE TECHNOLOGY

ARTIFICIAL INTELLIGENCE AS AN ENABLING TECHNOLOGY

- Artificial intelligence is an enabling technology (perhaps even a general-purpose technology).

- Three characteristics of general-purpose technologies (GPTs)
  1. Pervasive, i.e., in wide use;
  2. Capable of ongoing technical improvement;
  3. Enable complementary innovations in application sectors.

- Machine learning (ML) as a prediction technology
- Prediction tasks are pervasive in business and society

SOURCES: BRESNAHAN, 2012; BRESNAHAN AND TRAJTENBERG, 1995; GOLDFARB ET AL., 2019; TEECE, 2018

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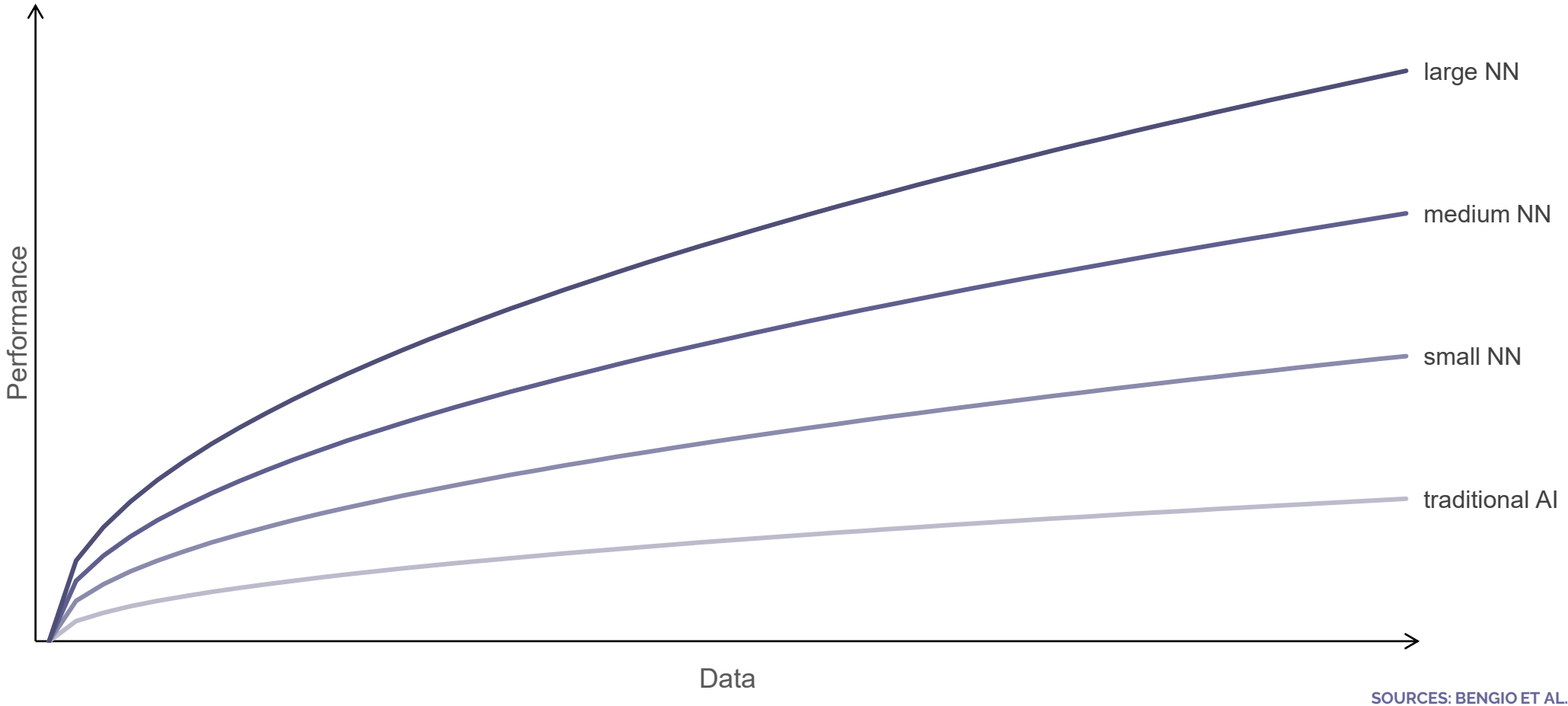
IMPROVED PERFORMANCE DUE TO DATA AVAILABILITY AND LARGER NEURAL NETWORKS (NN)



SOURCES: BENGIO ET AL., 2021; NG, 2017

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DATA NETWORK EFFECTS

- Traditional network effects:
  - *Direct* network effects: value derived by users from a network comes from users being able to interact directly with one another
  - *Indirect* network effects: value derived by users from a network comes from the increased likelihood of availability and variety of complements of the product

- Data network effects:
  - The more that the platform learns from the data it collects on users, the more valuable the platform becomes to each user

SOURCES: GREGORY ET AL., 2021; ROCHET AND TRIOLE, 2003; ZHU AND IANSITI, 2012; BOUDREAU, 2012; CHURCH ET AL., 2008; CLEMENTS AND OHASHI, 2005

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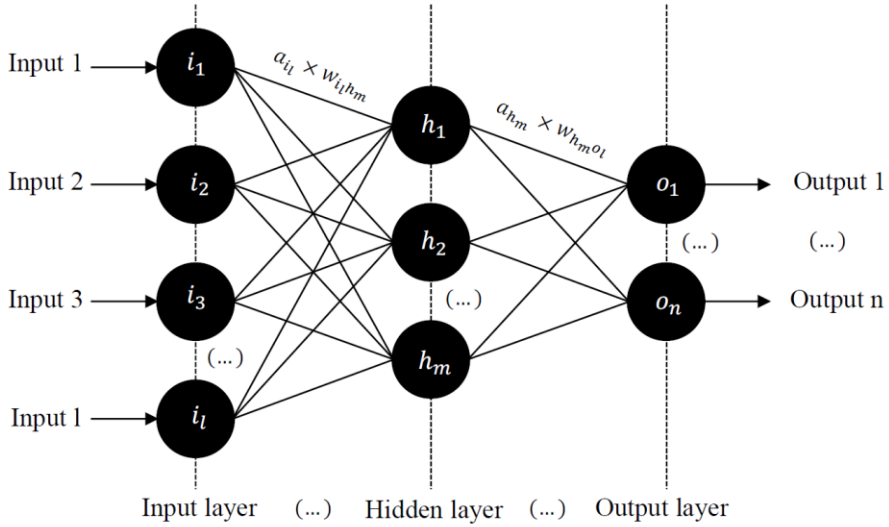
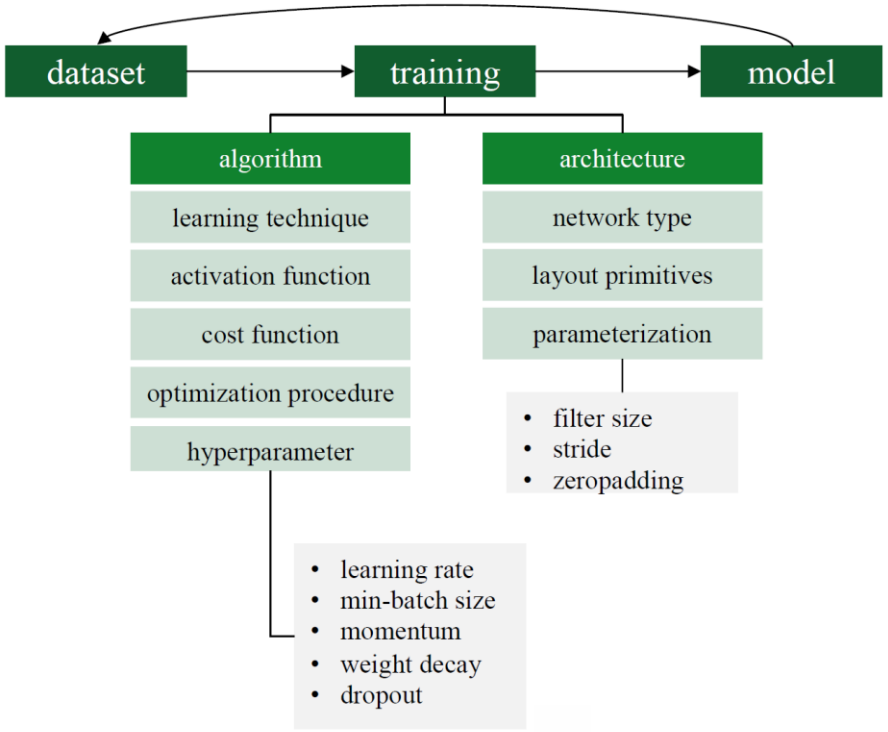
IMPLICATIONS FOR BUSINESS MODELS AND COMPETITIVE ADVANTAGE

- Design of business models should take into consideration data network effects
- More generally, competitive advantage is a factor of different assets in AI systems:





SOURCE: ITEM (HAEFNER AND SCHMICKLER)

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THE PATENTS–INNOVATION–PROSPERITY PARADIGM

PATENTS ARE A PART OF A BROADER RANGE OF MONOPOLISTIC PRACTICES

- Josef Schumpeter, seen as the father of modern innovation research, recognized **patents** as part of a broader range of **(temporary) monopolistic practices**,
- which also meant, that in the absence of patents, innovative firms could still rely on other strategies in order to secure monopoly power;
- **competitive advantages** are seen to create **incentives for inventions and technical progress**,
- which can increase the **growth** and **prosperity of an economy**.

SCHUMPETER, J.A. (1934). THEORIE DER WIRTSCHAFTLICHEN ENTWICKLUNG (8. AUFL.). BERLIN: DUNKER UND HUMBLOT.
RÉMY GUICHARDAZ & JULIEN PÉNIN (2019) WHY WAS SCHUMPETER NOT MORE CONCERNED WITH PATENTS? JOURNAL OF EVOLUTIONARY ECONOMICS VOLUME 29, PAGES1361–1369
GASSMANN AND BADER (2017, 2021) PATENT MANAGEMENT / PATENTMANAGEMENT

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THE OPEN INNOVATION PARADIGM

OPEN INNOVATION FOR CREATING AND PROFITING FROM TECHNOLOGY

- The US-American economist Henry William Chesbrough researched the opening of the innovation process as the **new imperative for creating and profiting from technology**;
- the **Open Innovation** procedures and practices generally are also including in the intellectual property environment,
- market players are increasingly willing to share and **multiply the value of intellectual property**.

CHESBROUGH H.W. (2003) OPEN INNOVATION: THE NEW IMPERATIVE FOR CREATING AND PROFITING FROM TECHNOLOGY
GASSMANN AND BADER (2017, 2021) PATENT MANAGEMENT / PATENTMANAGEMENT

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WHERE AND HOW TO GAIN COMPETITIVE ADVANTAGES?

PRACTICE OF „COOPETITION“

long term
sustainable

Competitive advantages by temporary monopoly gains

faster
better
cheaper

Legal Protection Strategies

Intellectual property rights secure own freedom of action and block competitors

Factual Protection Strategies

Focus on exclusivity,

Reduction of risk of imitation

- **Confidential processes and actions**
- **Strong distribution channels**
- **Control of value chain creation**
- **Economies of scale**
- **Short time to market**
- **Strong brand image**

Commons Strategies

Shared assets basis,

Reduction of costs and resources,

Multiplication of innovation potential

Support and leverage factual protection strategies

SOURCE: BASED ON GASSMANN AND BADER (2017, 2021) PATENT MANAGEMENT / PATENTMANAGEMENT

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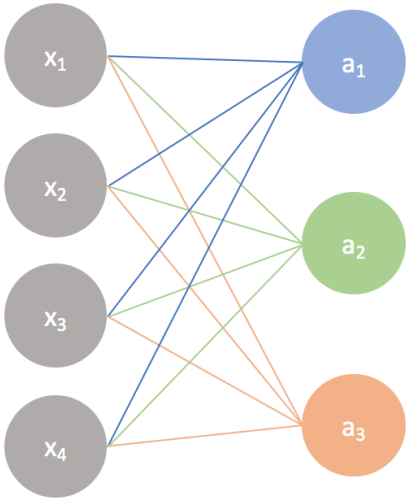
TECHNICAL LIMITATIONS TO PROTECTION STRATEGIES

- AI models can consist of several hundred to billions of parameters (model weights)!
- Currently there are no methods to determine whether or to what extent two models are similar.



$$\begin{bmatrix} w_1 & w_2 & w_3 & w_4 \\ w_1 & w_2 & w_3 & w_4 \\ w_1 & w_2 & w_3 & w_4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} + \begin{bmatrix} b \\ b \\ b \end{bmatrix} = \begin{bmatrix} w_1x_1 + w_2x_2 + w_3x_3 + w_4x_4 + b \\ w_1x_1 + w_2x_2 + w_3x_3 + w_4x_4 + b \\ w_1x_1 + w_2x_2 + w_3x_3 + w_4x_4 + b \end{bmatrix} \xrightarrow{activation} \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix}$$

SOURCE: JORDAN , 2017

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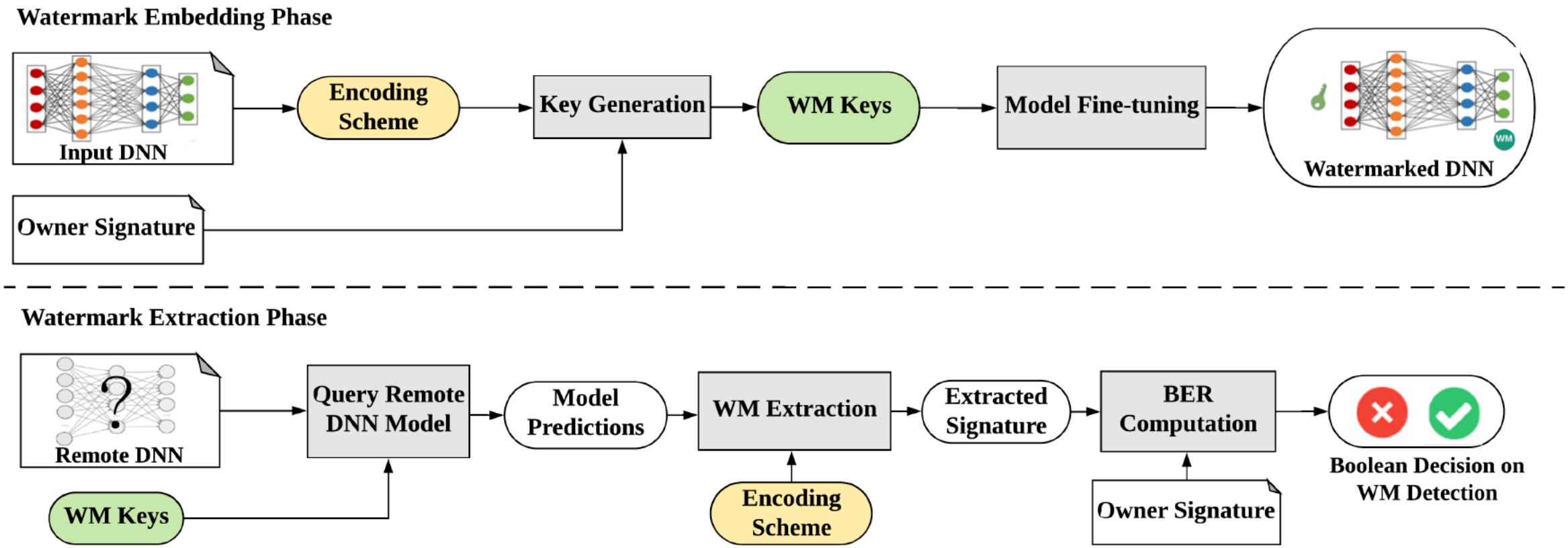
TECHNICAL APPROACHES TO ENABLING PROTECTION

WATERMARKING



SOURCE: CHEN ET AL., 2019

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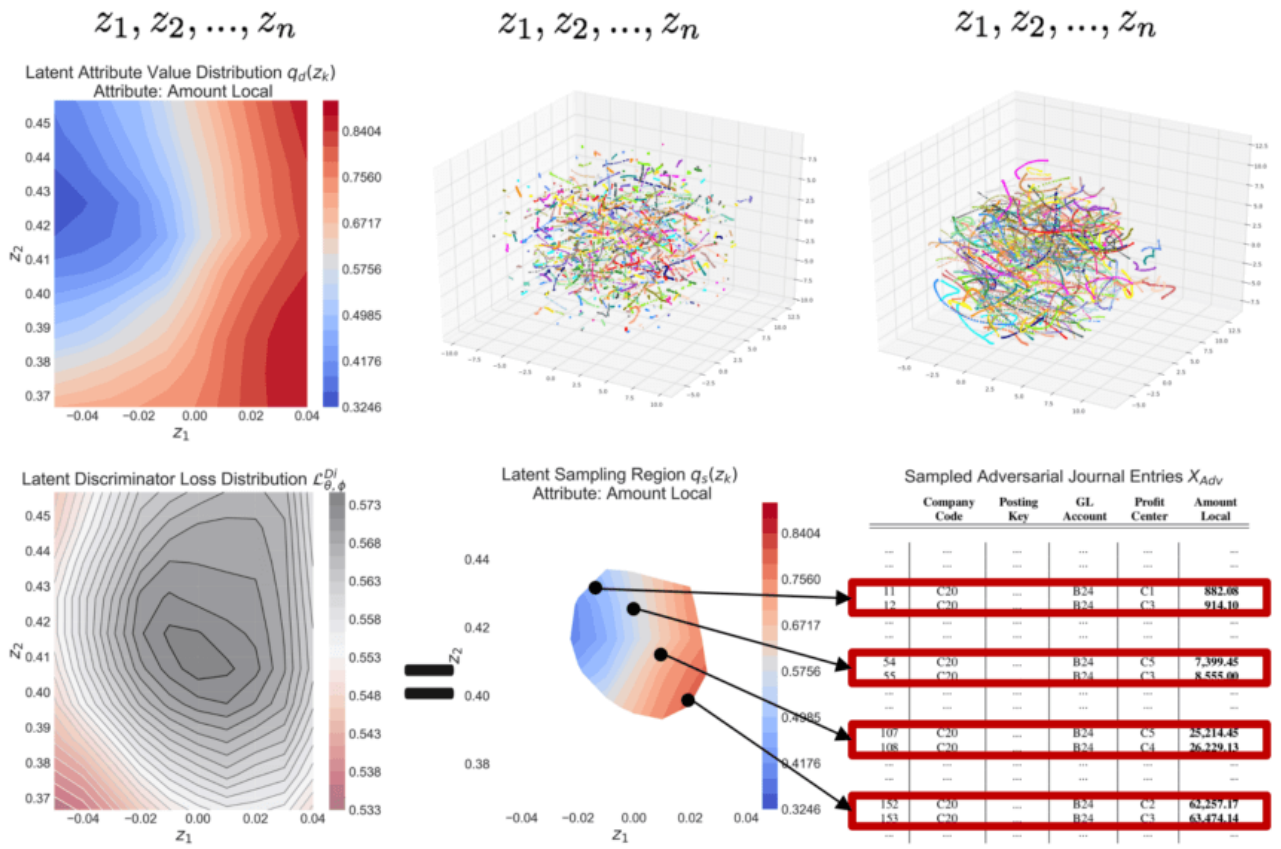
TECHNICAL APPROACHES TO ENABLING PROTECTION

REPRESENTATION LEARNING WITH DEEP NEURAL NETWORKS



SOURCE: BORTH ET AL., 2021

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PROPRIETARY INNOVATION VS. *OPEN* INNOVATION

AI SPECIFICS:

illustrative

Proprietary innovation → Differentiation:

Means:

- Proprietary datasets, a/o
- Proprietary models, algorithms and training strategies, a/o
- Proprietary source code & libraries, a/o

illustrative

Effect:

+ **Basis to leverage competitive advantage**
+ Proprietary position, e.g. exclusive dataset, as basis to receive funding, investments, exit strategies
+ Application specific IP possible
- Potentially limited innovation progress
- Potentially unclear/intransparent ethical standards

illustrative

Open innovation → Commonization:

Means:

- Access to common datasets & pooling of datasets to increase learning bias, a/o
- Publication of algorithms and training strategies, a/o
- Publication of source code & libraries, a/o

illustrative

Effect:

+ **Acceleration of innovation progress**
+ Free flow of information
+ Open discussion
+ Foster publications
- Pressure to gain intrinsic R&D, public funding or philanthropic investments

SOURCE: BASED ON GASSMANN AND BADER (2021) PATENT MANAGEMENT

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Martin A. Bader is a European and Swiss Patent Attorney. As well as being Partner and Co-Founder of the specialized innovation and intellectual property management advisory group BGW AG St. Gallen, he has, since March 2016, been Professor for Technology Management and Entrepreneurship at the University of Applied Sciences Ingolstadt (THI). Previously to his current engagement as lecturer for intellectual property management and R&D management, he was Head of the Intellectual Property Management Competence Center at the Institute of Technology Management at the University of St. Gallen (HSG) and was, until 2002, Vice President and Chief Intellectual Property Officer at Infineon Technologies, Munich.

He is a mediator at the Mediation Center for Alternative Dispute Resolution at the World Intellectual Property Organization (WIPO) and has for many years been regarded as being among the top 300 intellectual property strategists worldwide according to the Intellectual Asset Management magazine's IAM strategy 300 index. He is also a long-standing author of numerous specialist publications and an internationally sought-after speaker in the field of intellectual property management.

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PATENT MANAGEMENT

PROTECTING INTELLECTUAL PROPERTY AND INNOVATION

Gassmann, Oliver; **Bader**, Martin A. & **Thompson** MJ

2021, ~264 pages, 77 illus., 1st ed.

ISBN: 978-3-030-59008-6

This book provides an overview of the common concepts and building blocks of patent management. It addresses executives in the areas of innovation, R & D, patent and intellectual property management as well as academics and students.The authors give valuable information on the characteristics of patent and intellectual property management, based on the collaboration with companies and organizations from Europe, China, Japan, Argentina, Brazil, India, Canada and the US.

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PATENTMANAGEMENT

INNOVATIONEN ERFOLGREICH NUTZEN UND SCHÜTZEN

Gassmann, Oliver & **Bader**, Martin A.

2017, ~385 Seiten, 4. Auflage

ISBN: 978-3-662-49526-1

Dieses Buch bietet einen Überblick über gängige Konzepte und Bausteine des Patentmanagements. Es wendet sich an Führungskräfte in den Bereichen Innovation, F&E und Patentmanagement sowie Wissenschaftler und Studierende.

Basierend auf der Zusammenarbeit mit bzw. einer Analyse von mehr als 350 technologieintensiven Unternehmen aus Europa, den USA, China, Taiwan, Japan, Südkorea, Brasilien und Indien liefert es wertvolle Informationen zu den Ausprägungen des Patentmanagements. Die 4. Auflage wurde vollständig überarbeitet, aktualisiert und erweitert.

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