

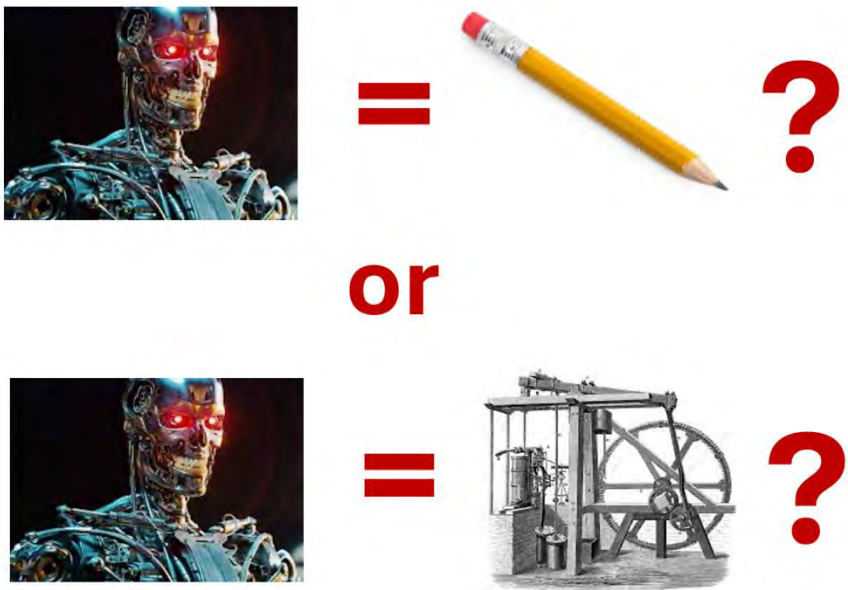
IS AI A GERAL PURPOSE TECHNOLOGY?

ABSTRACT

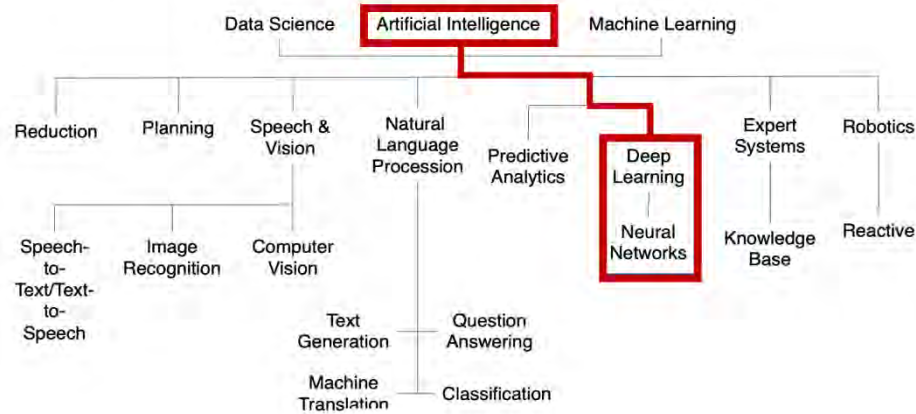
A general purpose technology (GPT) is an exceptional link in a complex chain of innovations connected through space and time. Common examples include the steam engine, electrification, and the automobile (Bresnahan & Trajtenberg, 1995; Bresnahan & Trajtenberg, 1995; & Bekar, et. al., 2018). A GPT is set apart from other innovations because of the massive breadth, depth, and duration of their impact on our world and, therefore, worthy of special consideration. (Trajtenberg, 2019; Bekar, et. al., 2018; Strohmaier & Rainer, 2016; Ott, et. al., 2009; & Bresnahan & Trajtenberg, 1995).

Yet, the changes GPTs bring can take decades and even centuries to manifest fully and much of GPT research to date is post hoc (Bresnahan & Trajtenberg, 1995; Lipsey, Bekar, & Carlaw, 2005; & Jovanovic & Rousseau, 2005). Yet executives, entrepreneurs, researchers, policymakers, and investors would all benefit from foresight anticipating the next GPT. This research explores this prospect empirically by tracing the ‘pervasiveness dimensions’ of a candidate GPT before its ultimate economic and societal impact is observed. Our candidate GPT is Artificial Intelligence (AI) and a key enabling technology, Deep Learning (DL).

We trace the evolution of AI and DL from their birth in the latter half of the 20th century to the present, with a focus on the diffusion of large-scale applications of AI/DL from 2000 to 2020 (Goldfarb, et. al, 2021). We are aided by a rich base of prior academic research across various disciplines as well as industry analyses and reports. We hope to add a forward-looking tool to the decision-makers toolkit, while also increasing our understanding of AI not only as an innovation but as an extraordinary technological, economic, social, and even political phenomenon



AI is set apart by DL...



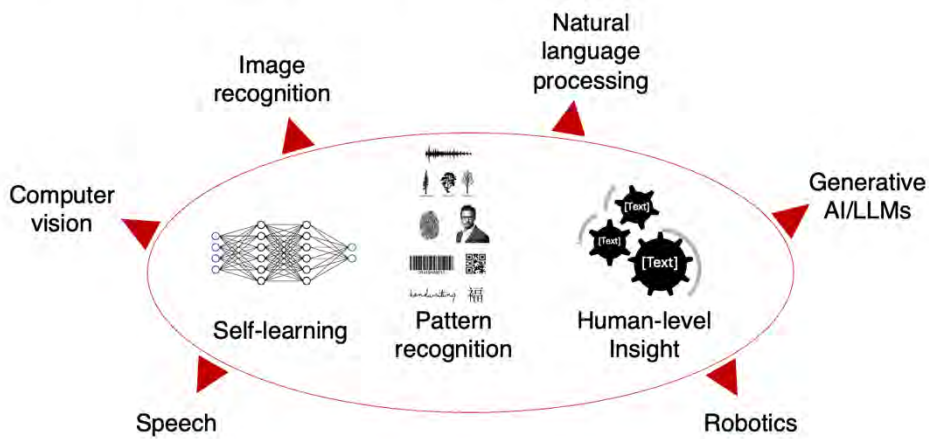
...& complete pervasiveness.



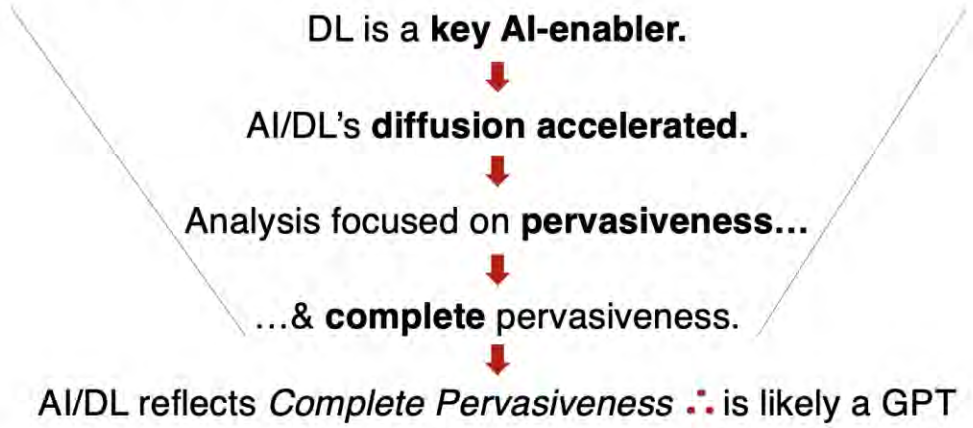
My research objectives...

- Support the **proposition** AI is a **General Purpose Technology** (GPT).
- Develop a **forward-looking tool for decisionmakers** assessing **any innovation with macro-impact potential**.
- Explore the **economic, business, & societal implications** of AI.
- Better understand of the **process of innovation**.

...& DL is a key AI-enabler.



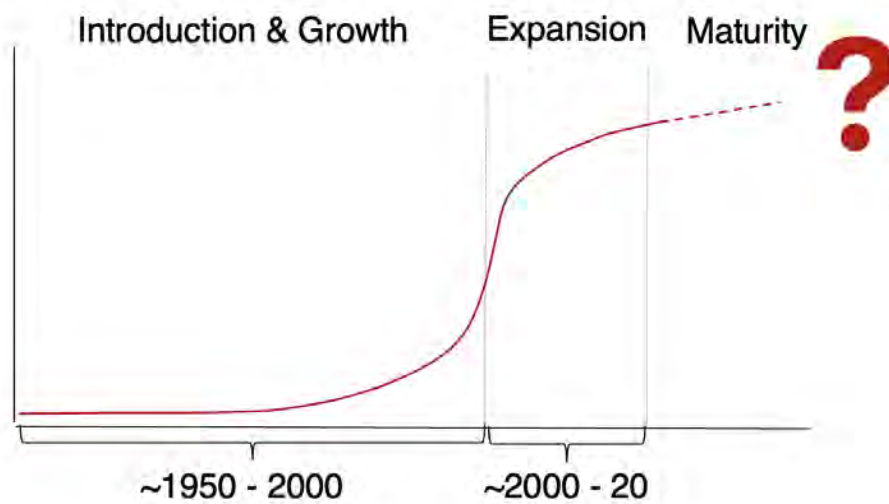
My research is propositional.



My research questions:

- Is a GPT concept valid?
 - What are the **claims of GPT skeptics**?
 - What is the **support for GPT theory**?
- Is AI a GPT?
 - What is a **useful definition of AI** (for GPT theory)?
 - Does **data support the proposition AI is a GPT**?
- Can our analysis inform a **forward-looking decision tool**?
- Does our analysis contribute to **understanding innovation**?

AI/DL's diffusion accelerated.



My contributions to current research.

- The **definition** of a GPT. (Trajtenberg, 2019; Bekar, et. al., 2018; Strohmaier & Rainer, 2016; Ott, et. al., 2009; Kanelak, 1979; Lipsey, Carlaw, & Bekar, 2005; & Bresnahan & Trajtenberg, 1995). → **Enhanced the definition of a GPT** by focusing on & expanding the definition of pervasiveness.
- **Post hoc** analysis of GPTs. (Bresnahan & Trajtenberg, 1995; Lipsey, Bekar, & Carlaw, 2005; & Jovanovic & Rousseau, 2005). → Adding the possibility from **pre hoc analysis** using pervasiveness 'dimensions.'
- **Patent filings & job postings** assessing AI's pervasiveness. (Goldfarb, et. al, 2021 & Cockburn, et al., 2019). → **Expanding the number & variety** of quantitative measures of pervasiveness.
- **AI as a GPT.** (Agrawal, Gans, & Goldfarb, 2018a/b & Agrawal et al., 2018a) → **Added to the body of evidence** supporting the prospect that AI is a GPT.

My lit review revealed that...

1. GPT theory has **skeptics**.
2. GPT theory **bridges multiple disciplines**.
3. GPT definitions **vary & some appear 'soft.'**
4. Scholars have addressed the question: *Is AI a GPT?*
5. AI definitions also **vary & are confusing**.
6. Forward-looking tools have a **mixed record of success**.

My analysis focused on pervasiveness...

	Electricity	Steam Engine	Auto	fMRI	Laser	AI
Pervasive	✓	✓	✓	✗	✗	?
Spawns Innovation	✓	✓	✓	✓	✓	✓
Improves Over Time	✓	✓	✓	✓	✓	✓

My research questions & key findings.

- Support the **proposition AI is a General Purpose Technology** (GPT). → **Enhanced the definition of a GPT** by focusing on & expanding the definition of pervasiveness.
- Develop a **forward-looking tool for decisionmakers** assessing **any innovation with potential macro-impact**. → Adding the possibility from **pre hoc analysis** using pervasiveness 'dimensions.'
- Explore the **economic, business, & societal implications** of AI. → **Expanding the number & variety** of possible quantitative pervasiveness measures.
- Better understand of the **process of innovation**. → **Added to the body of evidence** supporting the prospect that AI is a GPT.