Economics of AI: Concepts Cheatsheet

1. The Production Function & Tasks

Factors of Production Inputs used in the production process (the "ingredients"). While the classical view focuses on Capital (K) and Labor (L), general models can include Land, Natural Resources (N), Energy, and potentially new factors like Data or Intelligence.

Neoclassical Production Function
The traditional economic model $Y = F(K, L)$, where Output (Y) is produced by broad aggregates of Capital (K) and Labor (L). It often struggles to distinguish between specific technologies.

Task-Based Approach (Acemoglu & Restrepo)
A framework that views production not as labor vs. capital, but as a bundle of specific **tasks**. Automation occurs when capital (machines/AI) takes over a specific task previously performed by labor.

Substitution Effect
When technology replaces human labor in a specific task, reducing the demand for workers who perform that task.

Complementarity (Productivity) Effect
When technology increases the efficiency of production, lowering costs and increasing demand for the remaining tasks performed by humans.

Reinstatement Effect
The creation of *new tasks* generated by technological progress (e.g., prompt engineering, cybersecurity) that increases the demand for human labor.

2. The Nature of Technology

Prediction Machines (Agrawal, Gans, Goldfarb)
The economic definition of modern AI (Machine Learning) as a drop in the cost of **prediction**. This shifts demand toward complements (judgment, data) and away from substitutes (human prediction).

Cognitive Automation
The application of Generative AI to non-routine, creative, and reasoning tasks (white-collar work) that were previously considered immune to automation.

So-So Automation (Acemoglu & Johnson)
Technologies that are good enough to replace human workers but not good enough to generate

significant productivity gains. This often leads to labor displacement without the benefits of lower prices or higher growth.

The Turing Trap
The potential pitfall of focusing AI development solely on *mimicking* human performance (substitution) rather than *augmenting* human capabilities (complementarity).

3. Data Economics

Non-rival Good
A good that can be consumed or used by one person without reducing its availability to others (e.g., a digital file, an algorithm). Data is fundamentally non-rival.

Excludability
The ability to prevent others from using a good. While data is non-rival, it is often made **excludable** (kept private), making it a **Club Good**.

Increasing Returns to Scale
A production property where doubling inputs leads to *more* than doubling output. Data markets often feature this because more data leads to better algorithms, which attract more users, generating more data (feedback loop), often tending toward **Natural Monopoly**.

4. Growth & The Long Run

Endogenous Growth
Growth theory where technological progress is determined by investment in R&D and ideas ($\dot{A}$). If AI makes the "production of ideas" cheaper, it could lead to explosive growth.

Baumol's Cost Disease
The phenomenon where costs/wages rise in sectors that experience low productivity growth (e.g., healthcare, arts) because they must compete for labor with high-productivity sectors. Humans may retreat to these "stagnant" sectors as AI takes over high-productivity tasks.

Economic Singularity
A hypothetical future scenario where machine intelligence renders human labor obsolete in production, potentially driving the market clearing wage below the subsistence level.