



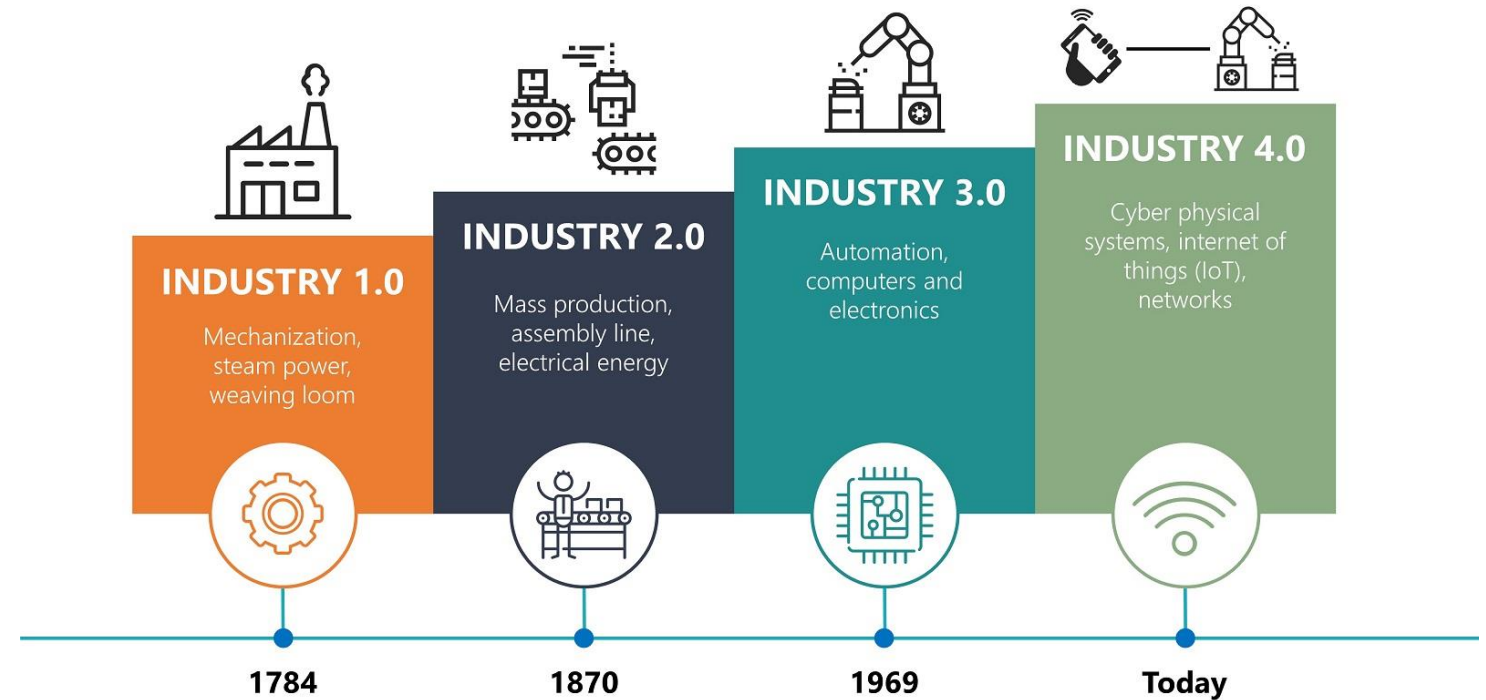
IoT for Agriculture

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We are in the
midst of a
technological
revolution!



1784: The steam engine changes everything

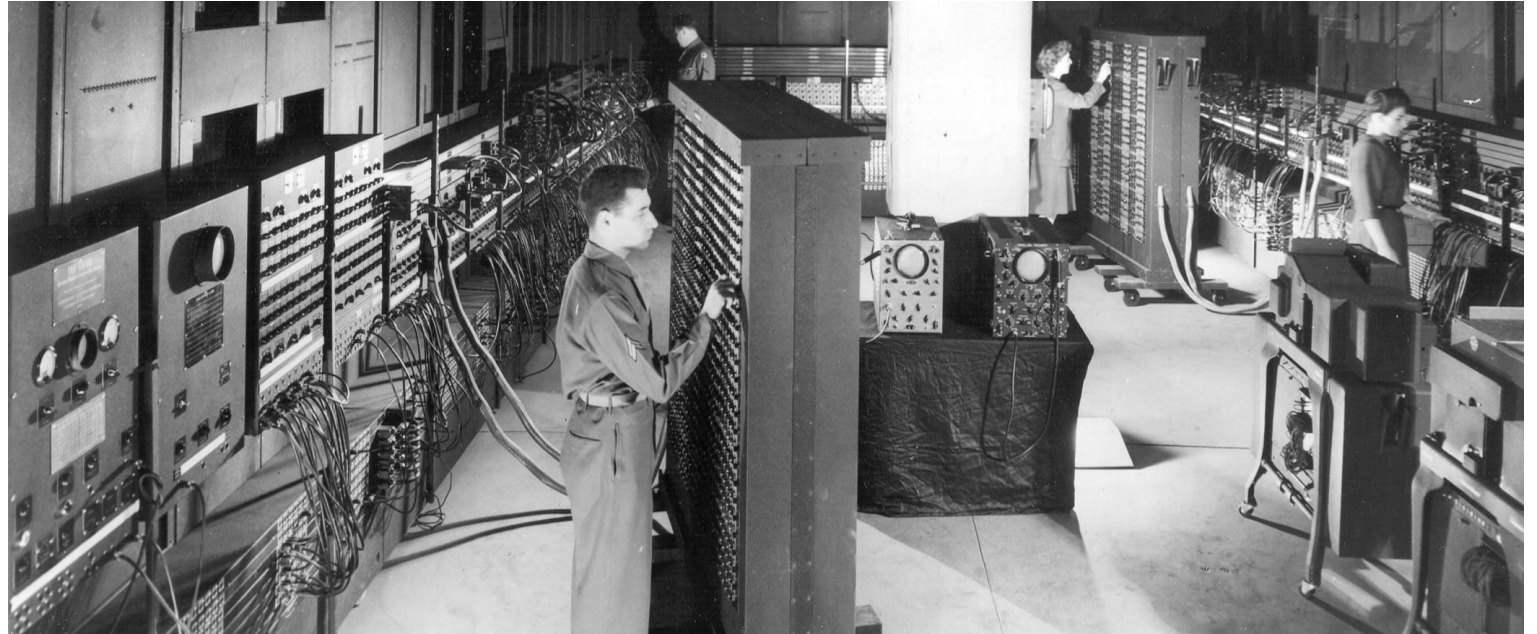
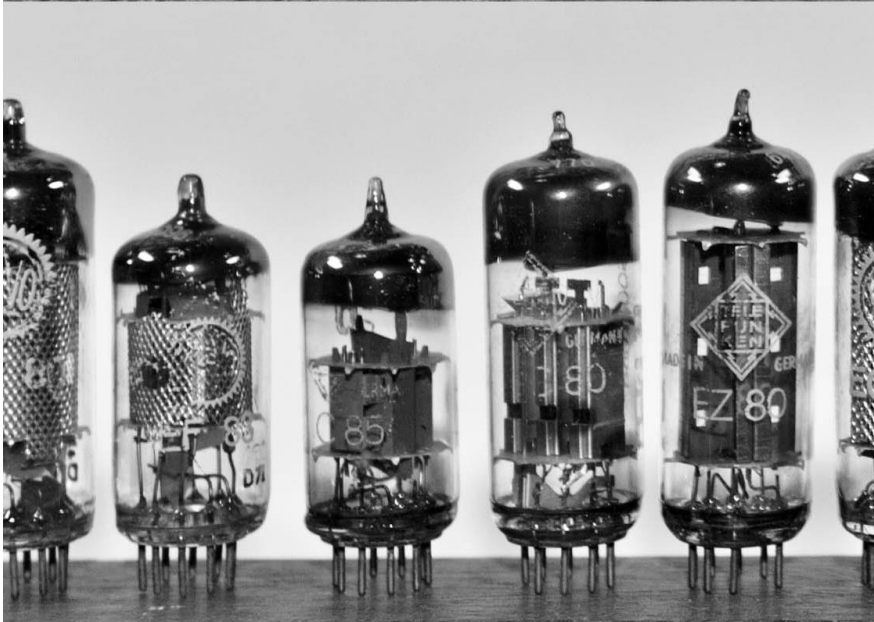
- Steam ships
- Railroads
- Mechanical weaving looms



1859: Oil and electrification change everything

- Automobiles
- Electric light bulb
- Telephones and telegraphs



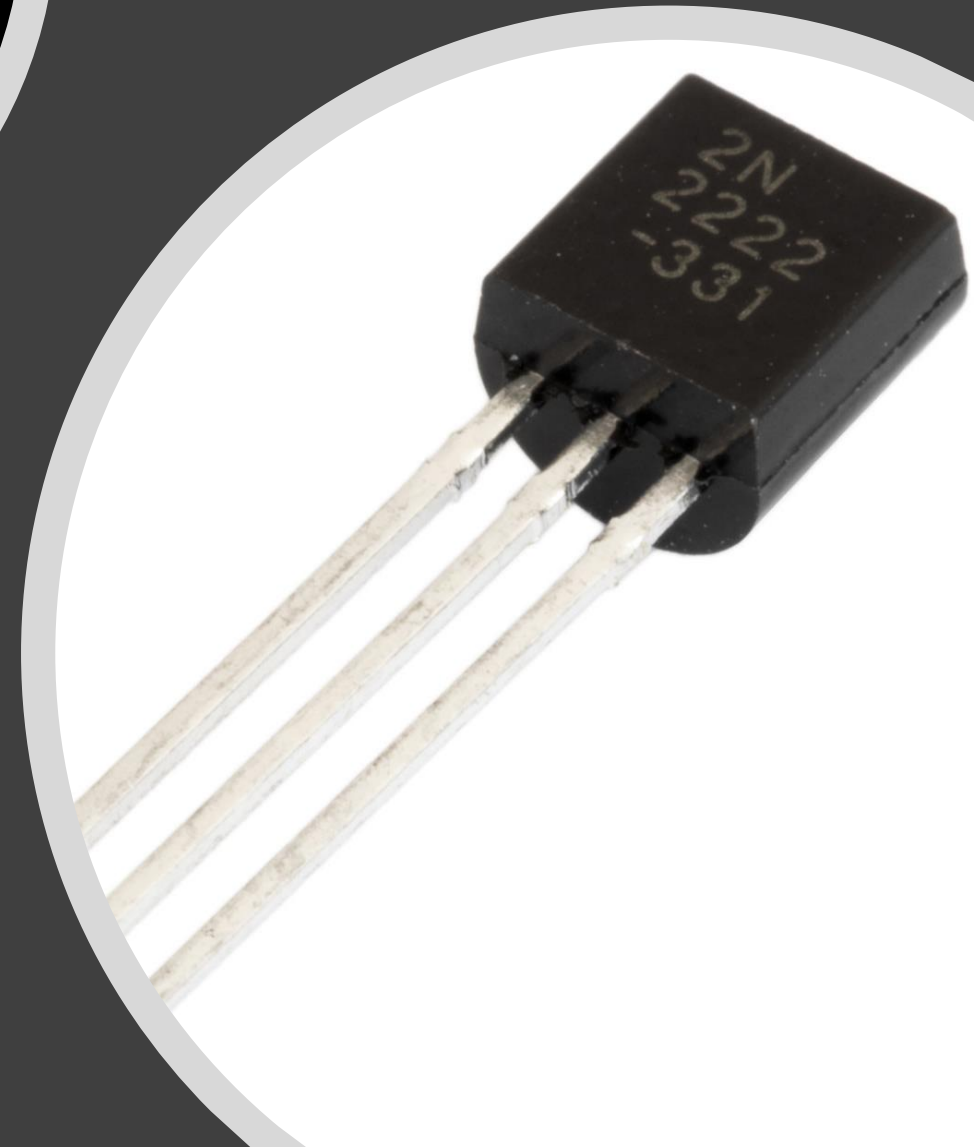


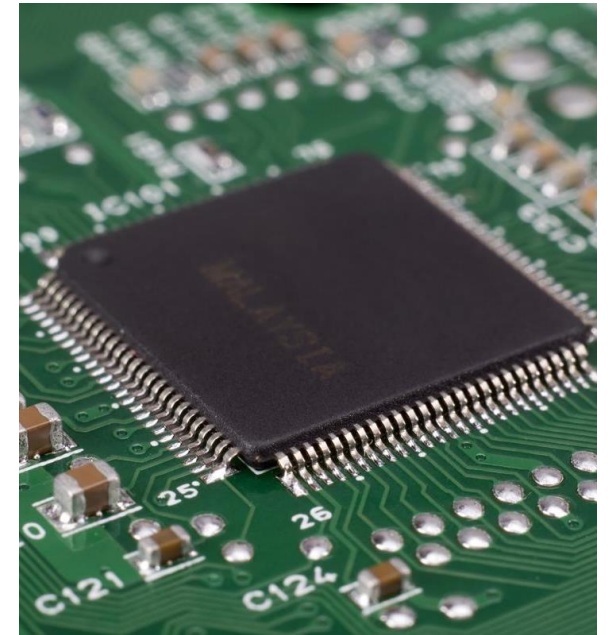
1945: The first digital computer is built using vacuum tubes



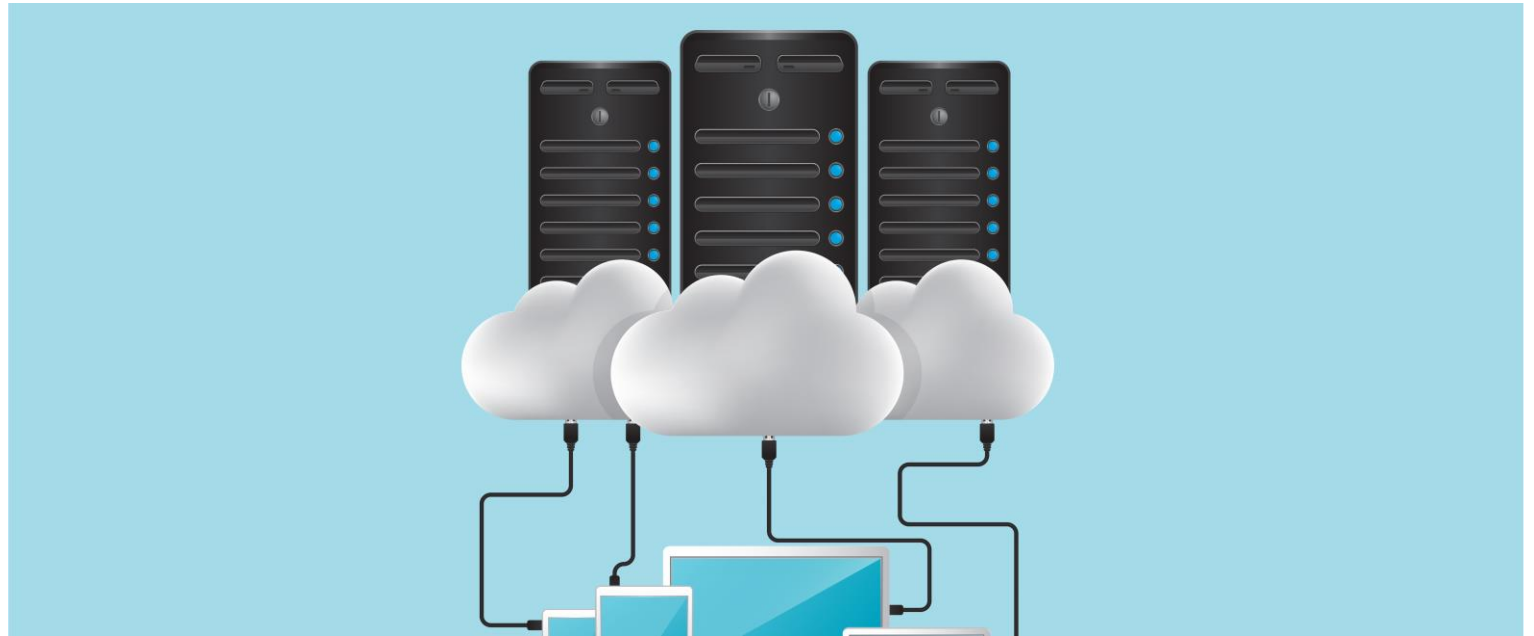
1948: The silicon transistor changes everything

- Digital computers
- Data networks
- Information and communication technologies



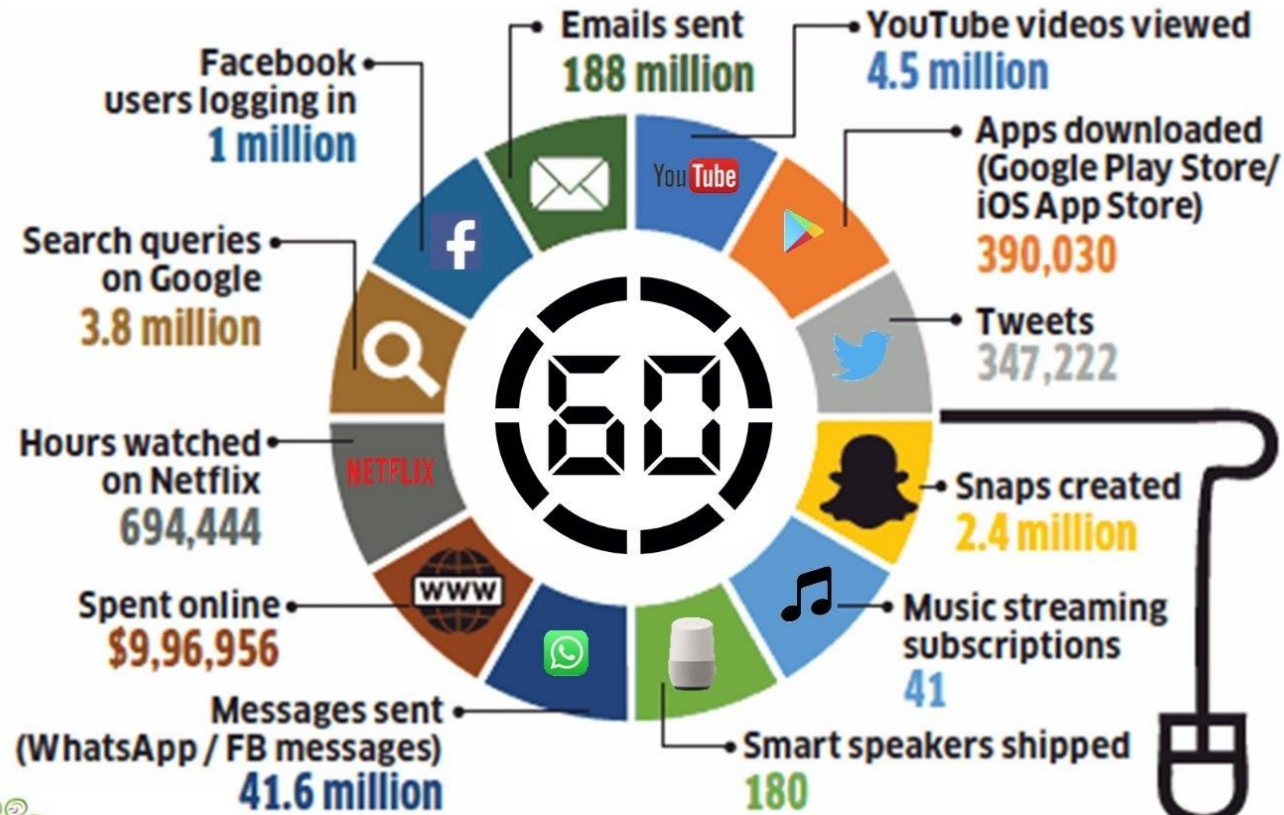


- ❑ 1965: Moore's Law
 - ❑ 1972: The microprocessor
 - ❑ 1982: The personal computer (PC)
-



- 1989: The World Wide Web is invented
 - 2007: The Apple iPhone is introduced
 - 2010: We work and play on “The Cloud”
-

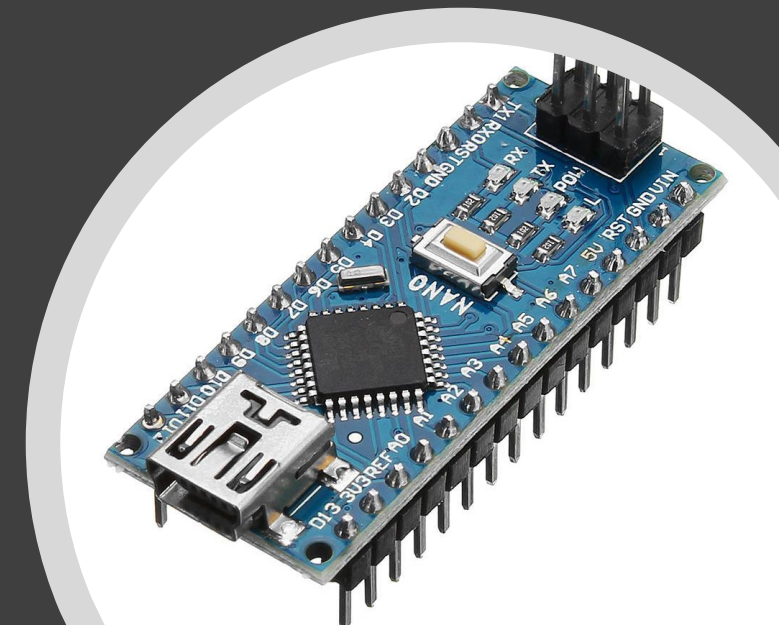
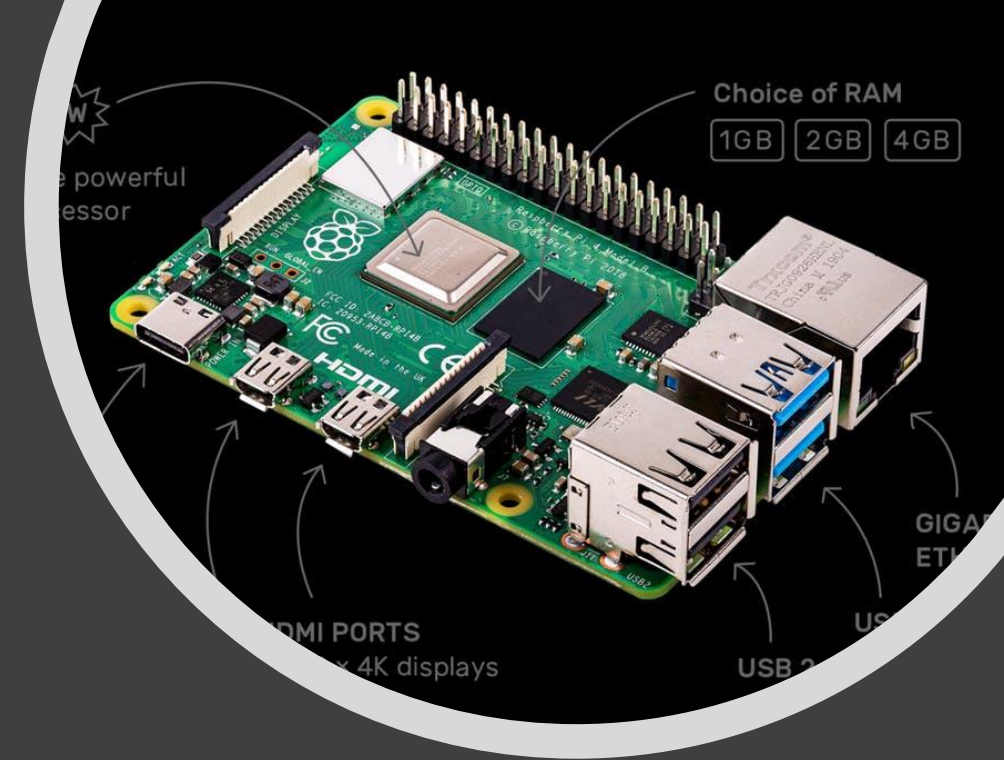
What Happens In An Internet Minute In 2019?



Source: @LoriLewis, @OfficiallyChadd

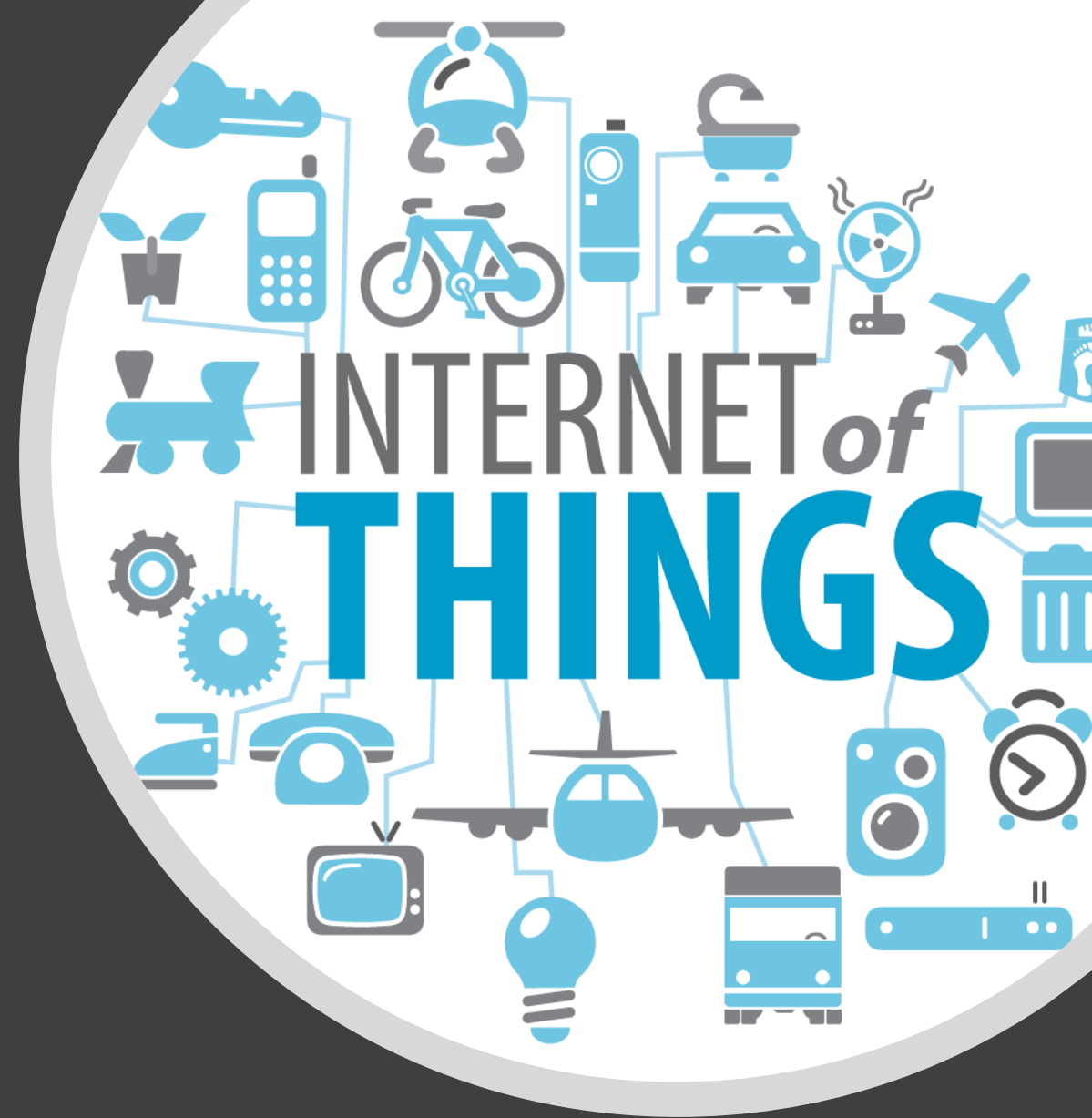
Rise of inexpensive hardware platforms

- ❑ 2003: *Arduino* becomes first open-source hardware/software platform for hobbyists and non-engineers.
- ❑ 2012: *Raspberry Pi* becomes first \$35 Linux-based SBC
- ❑ Open-source *Arduino* design leads to development of expansion module “shields” that provide sensor, actuation, and communication functionality.



Internet of Things (IoT) (c. 2010)

- ❑ Rich sensors and actuators +
- ❑ Inexpensive computational platforms +
- ❑ Maturing wired/wireless communication standards (e.g. WiFi, Bluetooth/BLE, LoRA) =
- ❑ Ability to monitor and/or control everyday objects (things) over the Internet.



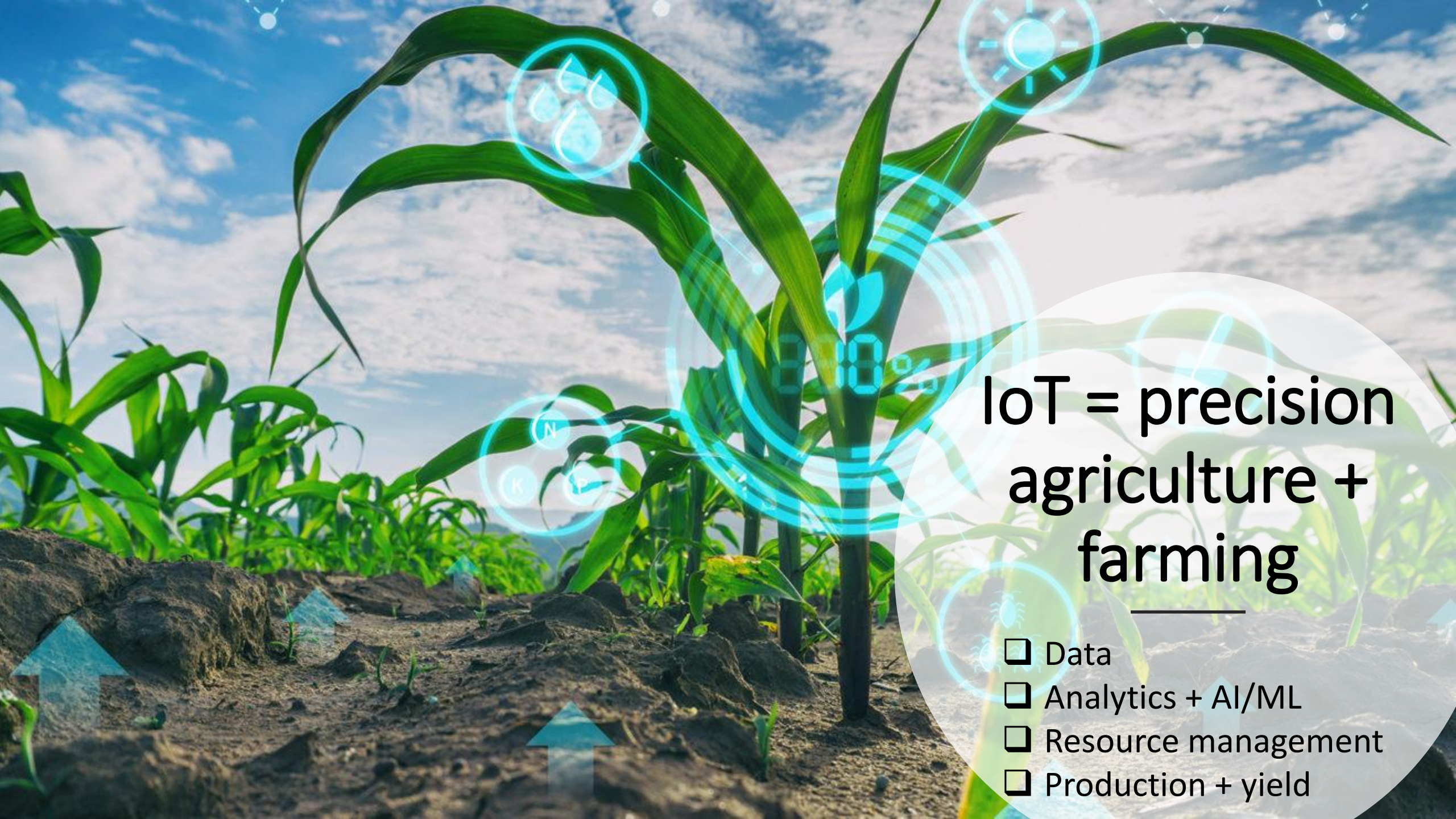
Parrot Flower Power

- ❑ Monitor the health of your plant from your smart phone.
- ❑ Customize to the needs of your plant species.





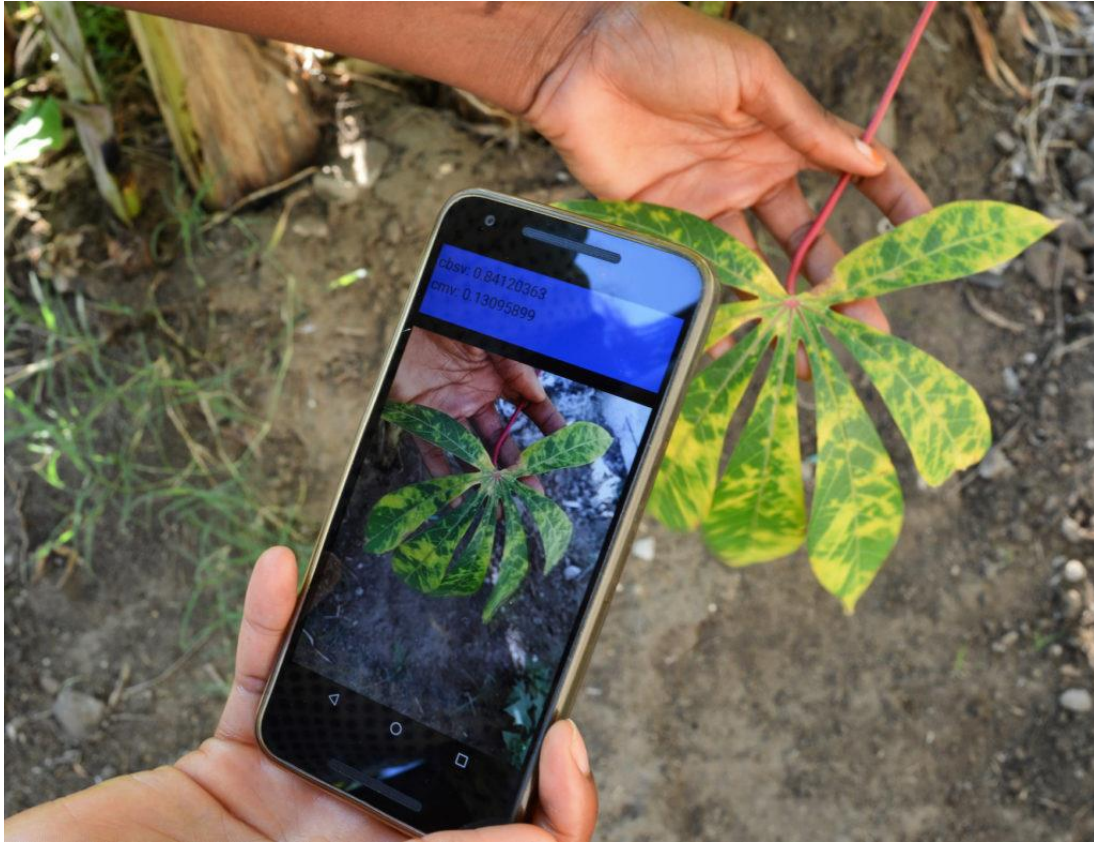
Cyber-physical systems:
IoT + AI/ML



IoT = precision agriculture + farming

- Data
- Analytics + AI/ML
- Resource management
- Production + yield

Detecting disease + monitoring crops





Precise delivery of herbicides + pesticides





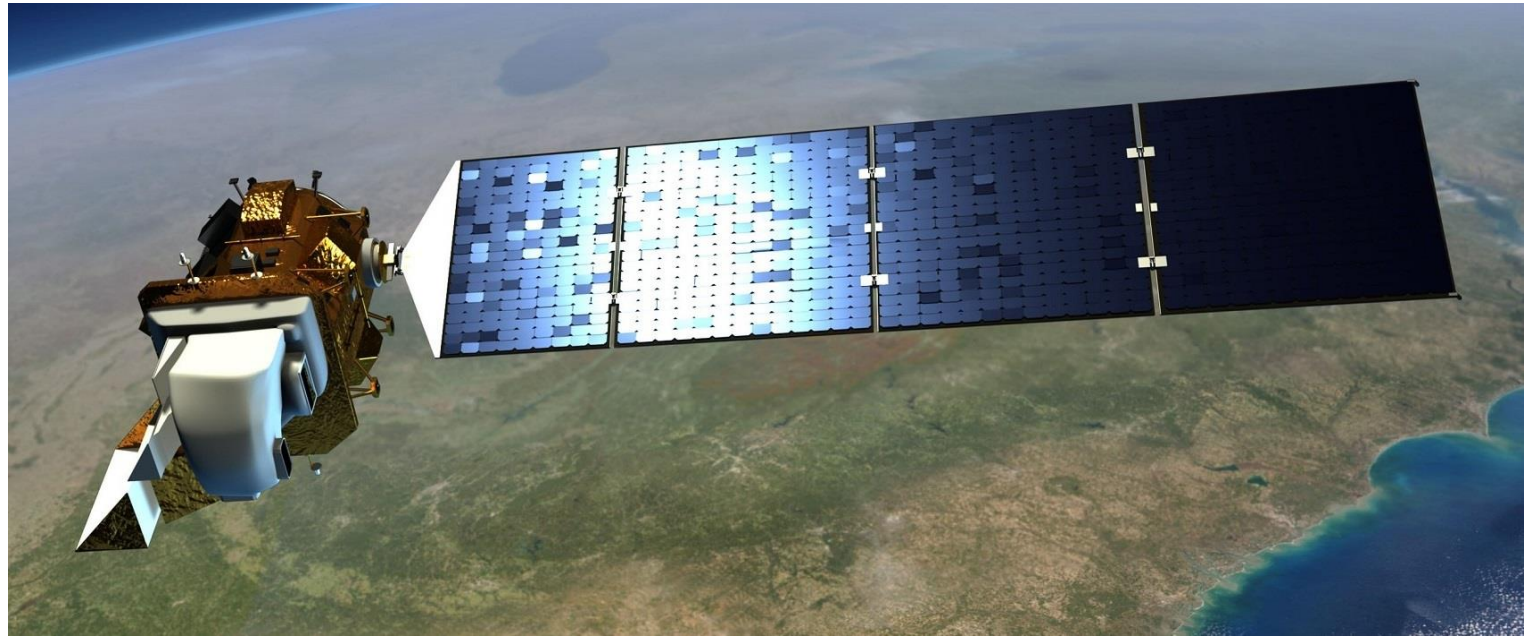
**Autonomous
Tractors Are Here**

Monitoring livestock + optimizing production

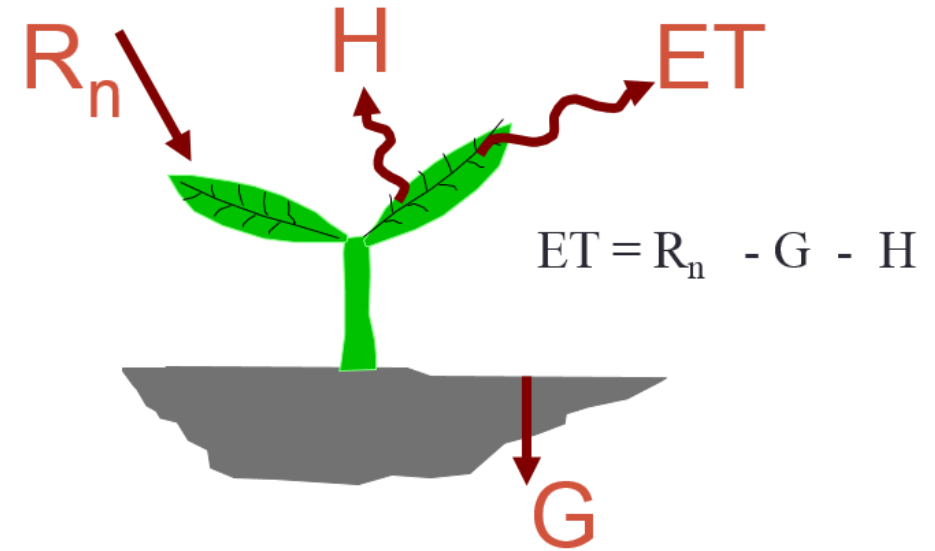
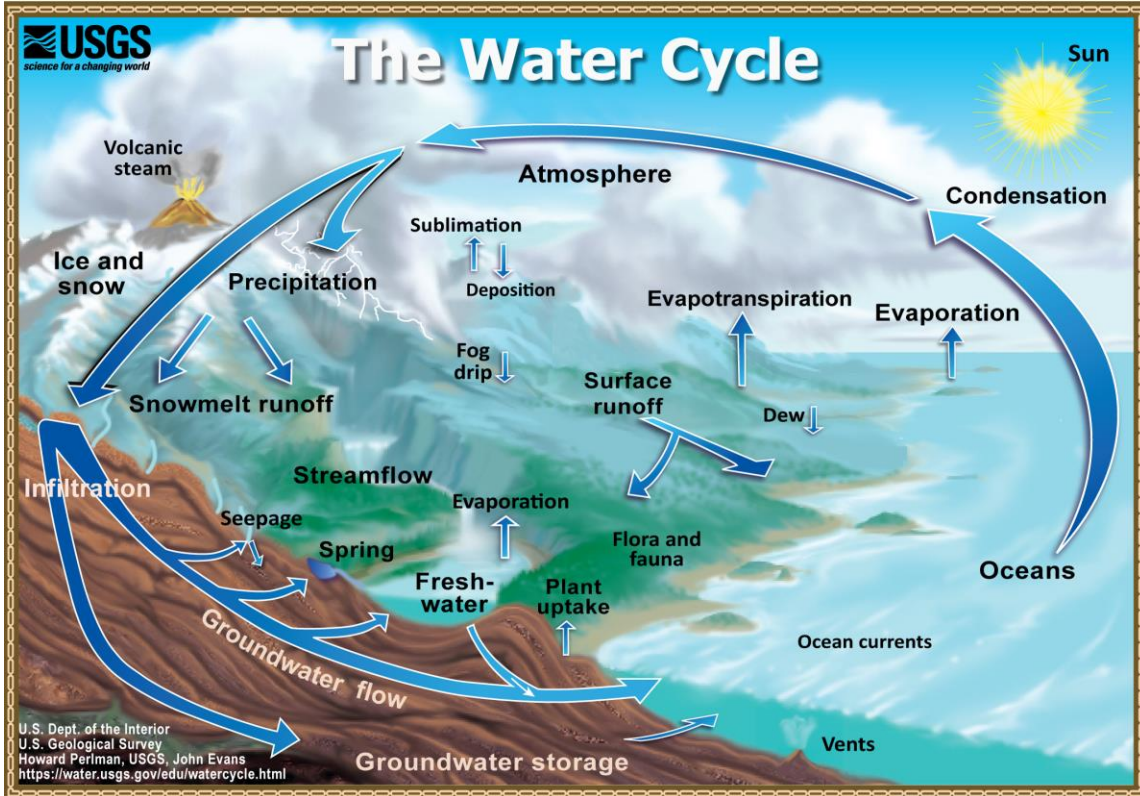




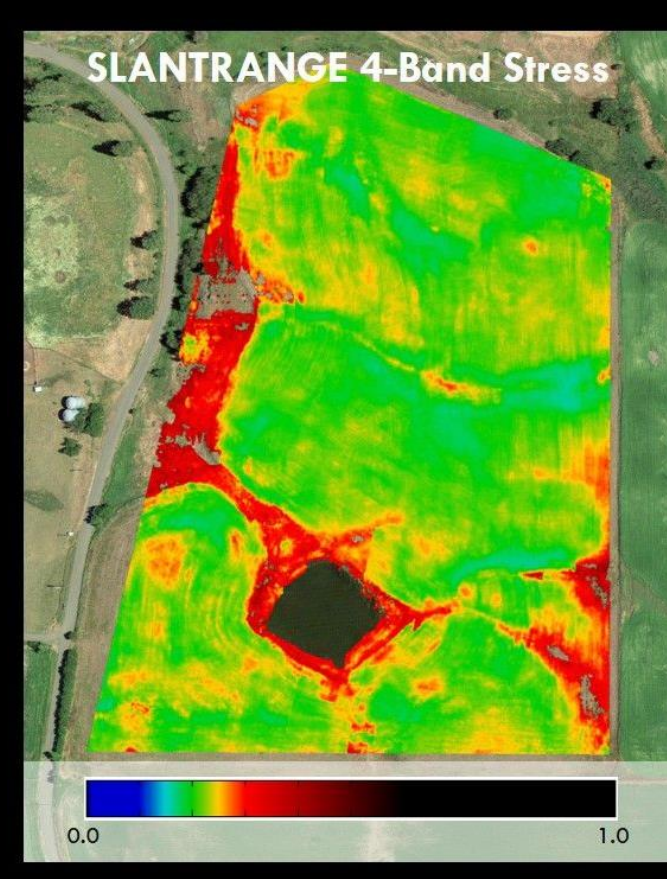
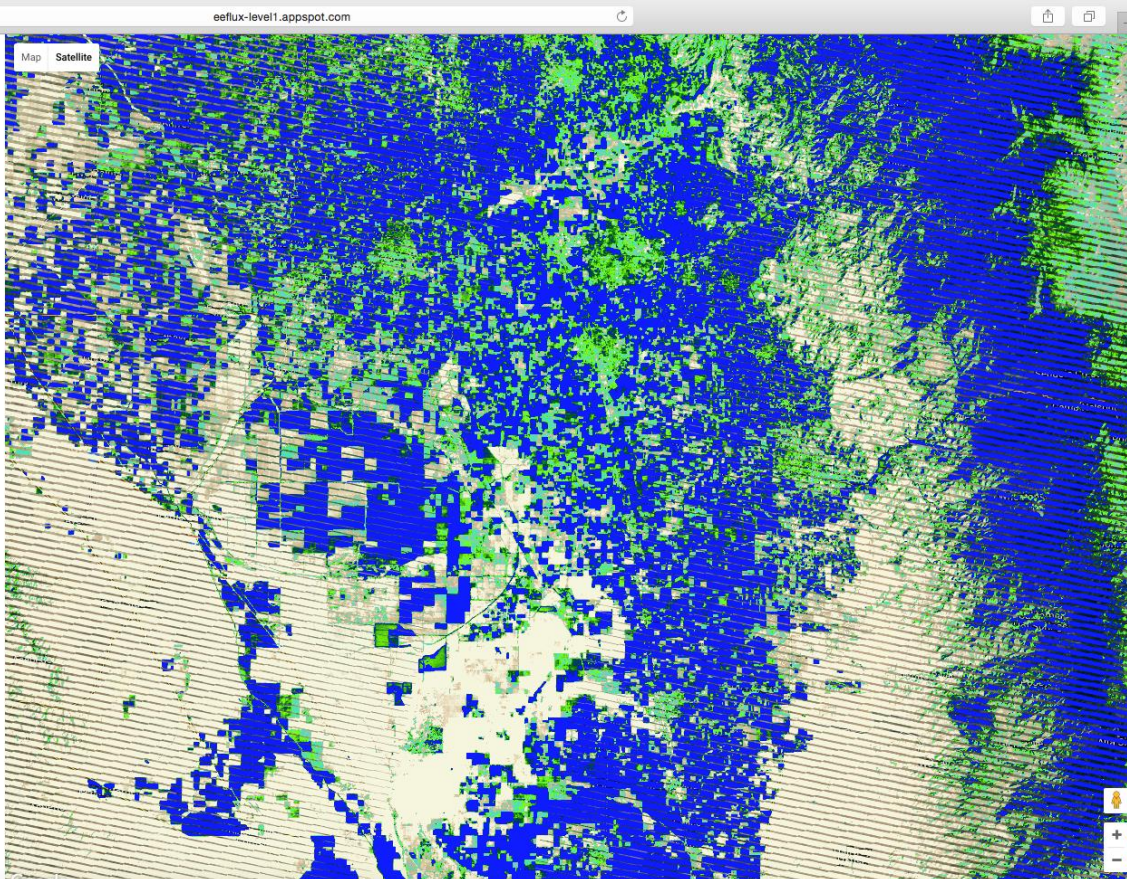
Precise irrigation



Remote sensing + AI/ML




Water cycle + evapotranspiration (ET)



Calculate ET from satellite images

- ❑ Use ML model to estimate ET on cloudy days, or when satellite data is missing.

A close-up photograph of a small, vibrant green seedling with several leaves growing out of a patch of severely cracked and parched brown soil. The cracks in the soil are deep and irregular, forming a complex network around the plant. The background is filled with the same cracked earth, emphasizing the harsh, arid conditions.

Great potential for applying IoT+AI/ML to agriculture
in our region.



Thank you!
