Software Gardening

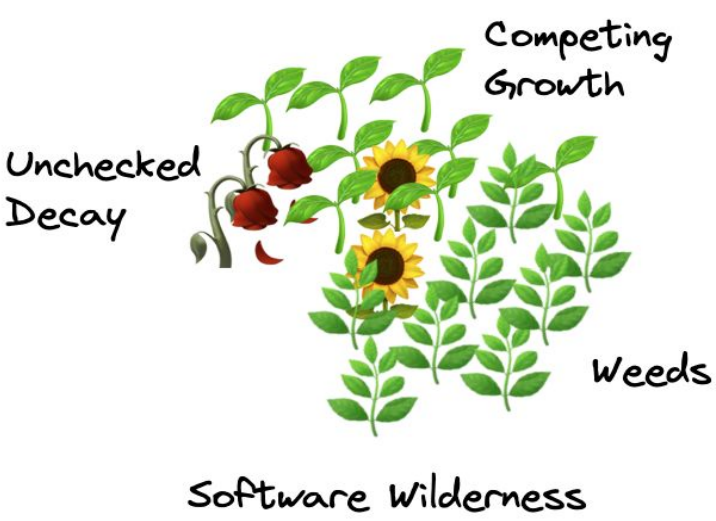
CPBS 7601
Computing Skills in Biomedical Sciences
Lecture 11
Fall 2024

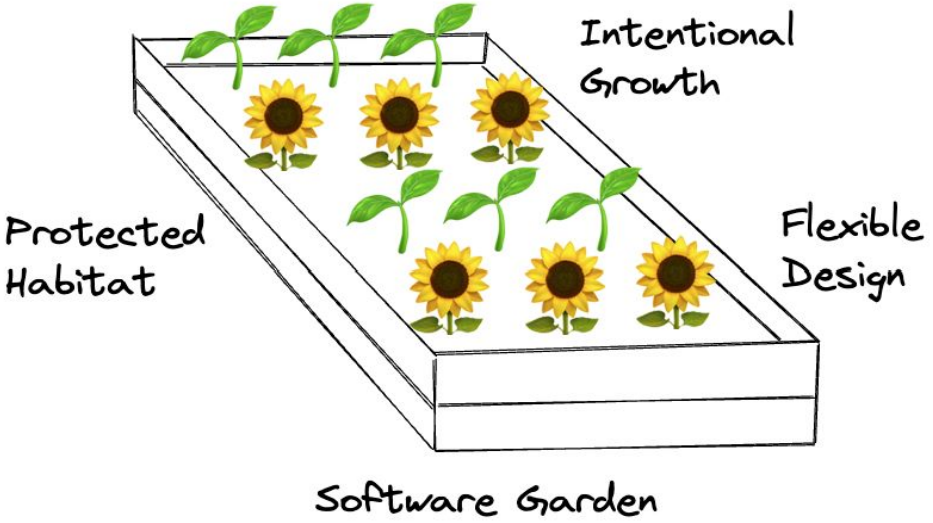
Outline

- Introduction
- Time
- Energy
- Gardening lattice
- Software forest
- Break
- Hands on

Software Gardening

Introduction

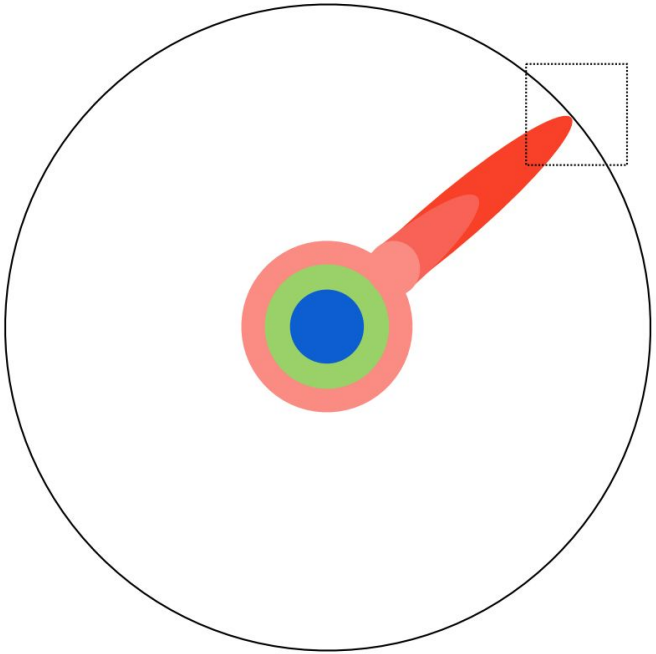




Software can be experienced as a wilderness or a garden.

Software Gardening

Introduction

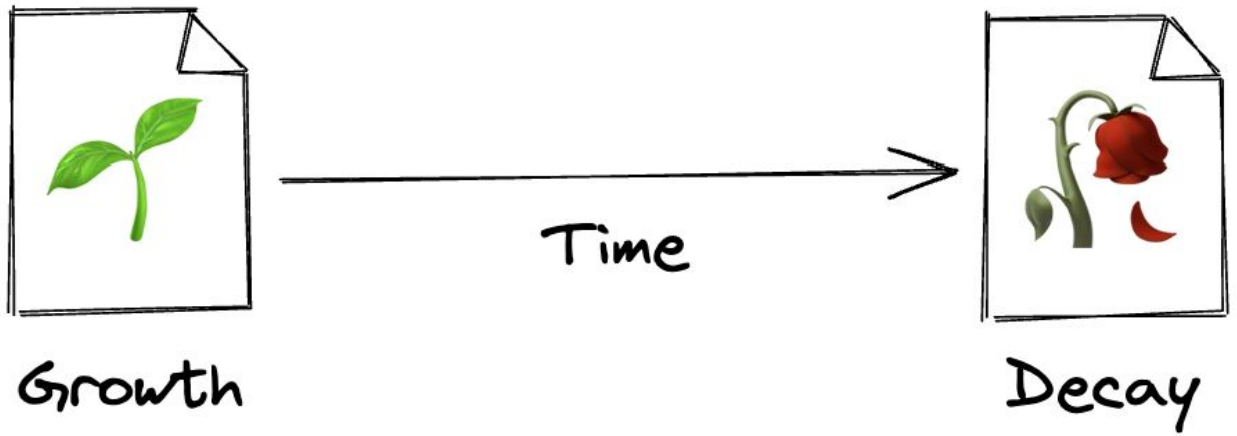


All software is a bit of a wilderness as we develop it.

The illustrated guide to a Ph.D. (link)

Software Gardening

Time



Time changes software.

Software Gardening
Time

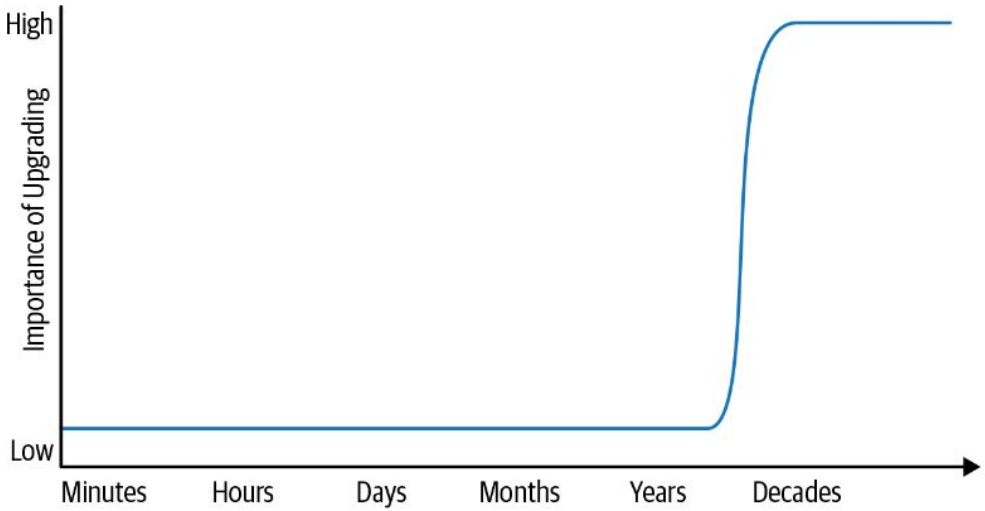
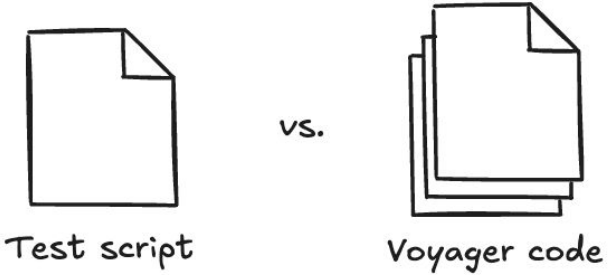


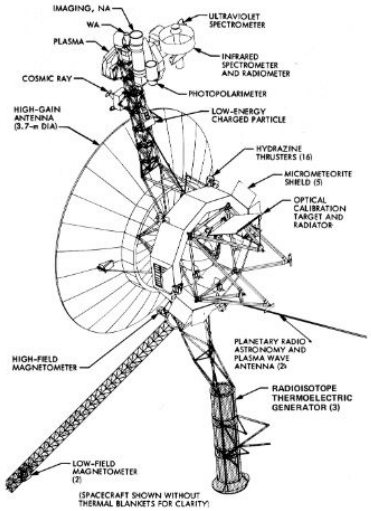
Figure 1-1. Life span and the importance of upgrades

Not all software needs to live forever.

Figure 1.1 from Software Engineering at Google, Chapter 1 (link)

Software Gardening
Time



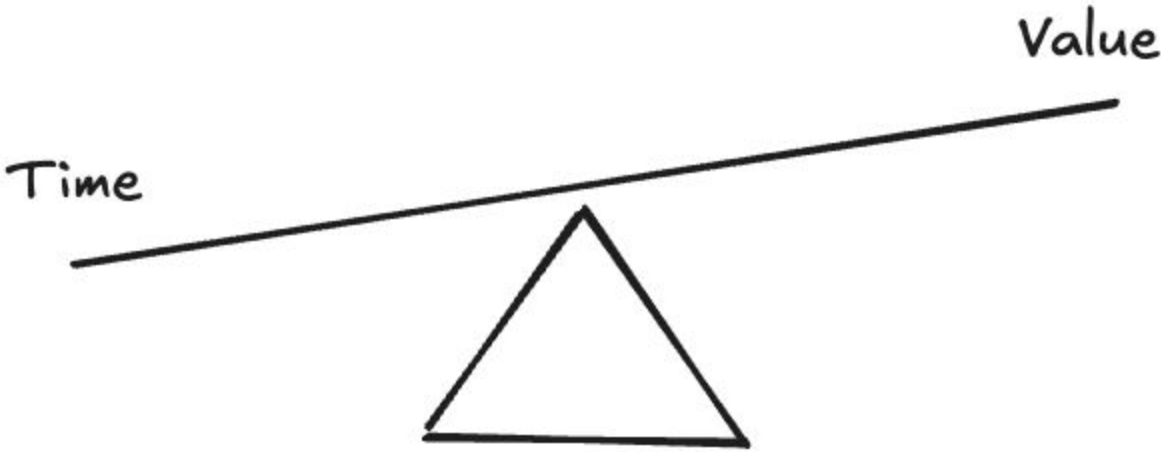


Not all code needs to survive 15 billion miles from earth.

Figures: left: (link), right: (link)

Software Gardening

Time



Navigating often involves decisions between time and value

Software Gardening

Time

What do we mean by “value” anyways?

Software Gardening

Time

“The ‘planetary garden’ is a means of considering ecology as the integration of humanity – the gardeners – into its smallest spaces. Its guiding philosophy is based on the principle of **the ‘garden in motion’: do the most for, the minimum against.**”
- Gilles Clément

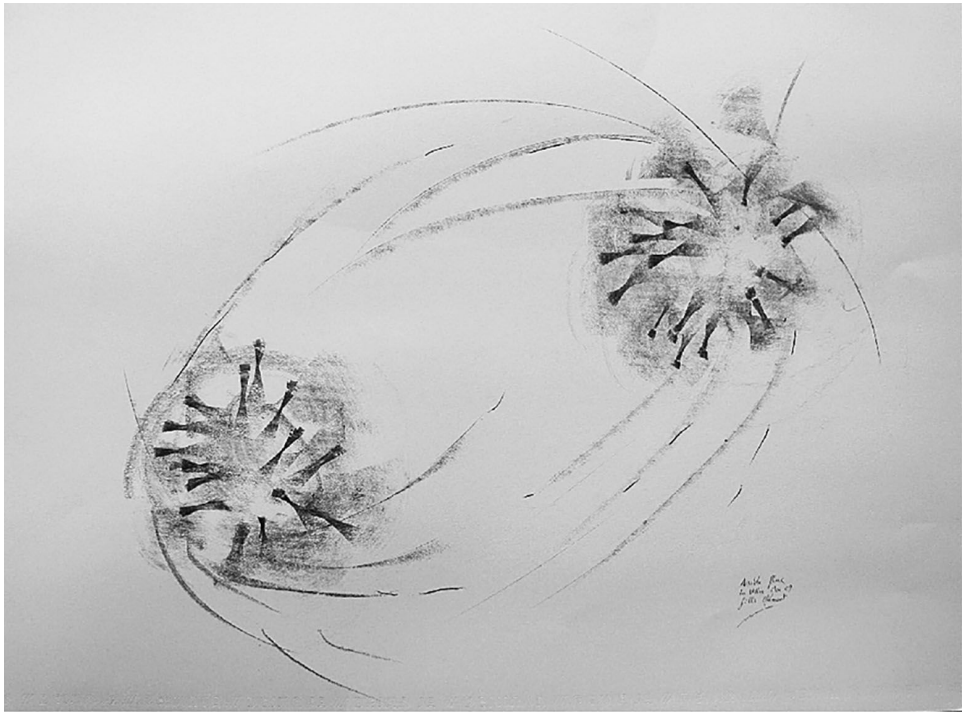
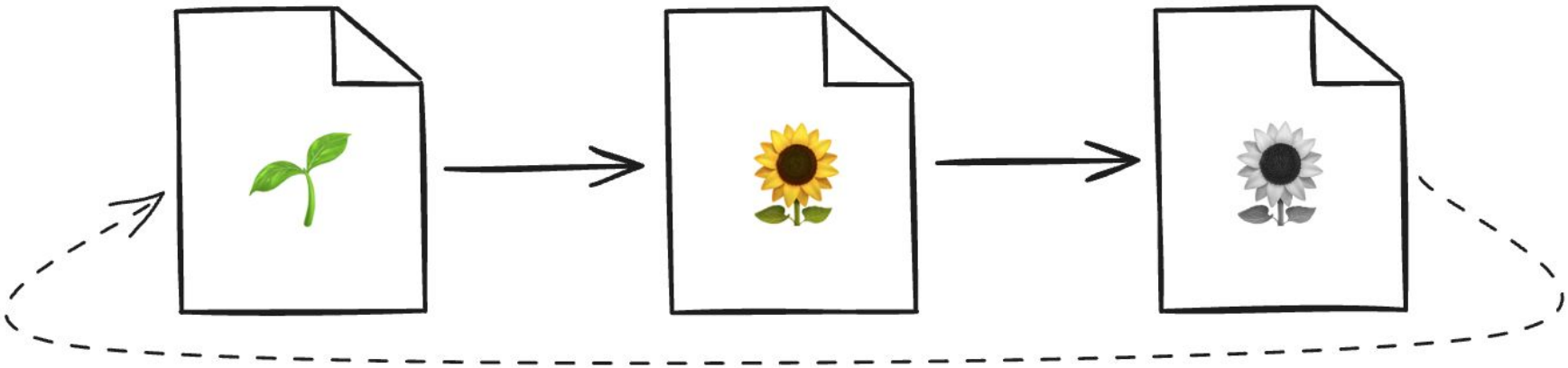


Figure: link

Software Gardening

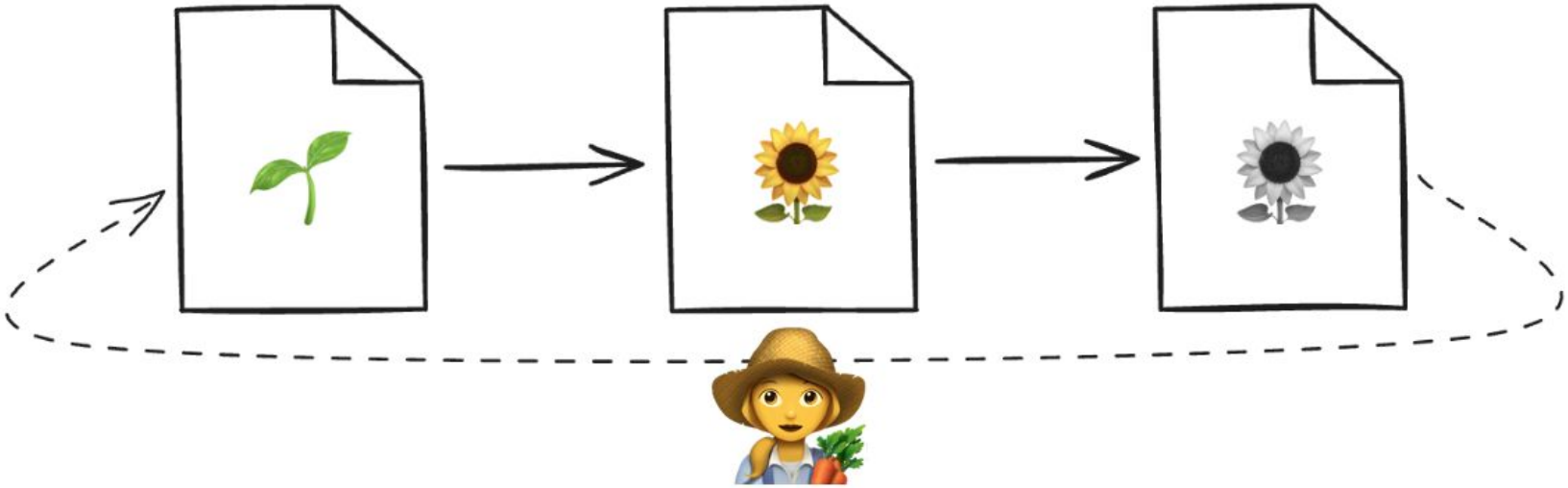
Energy



Code decay is a form of energy transfer.

Software Gardening

Energy



We’re usually active participants in this process!

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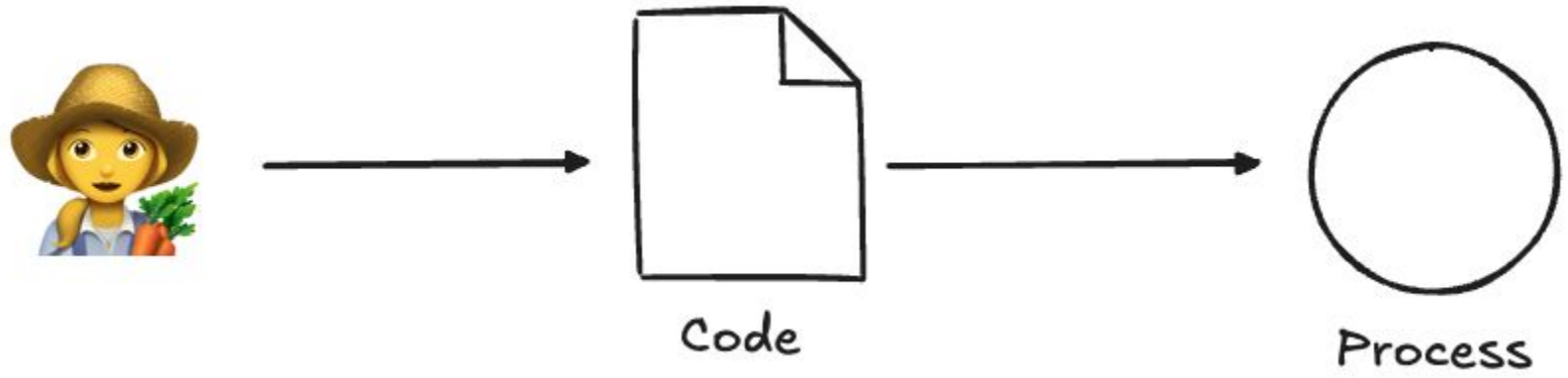
Energy



The energy cycle typically involves translating from one energy source to another.

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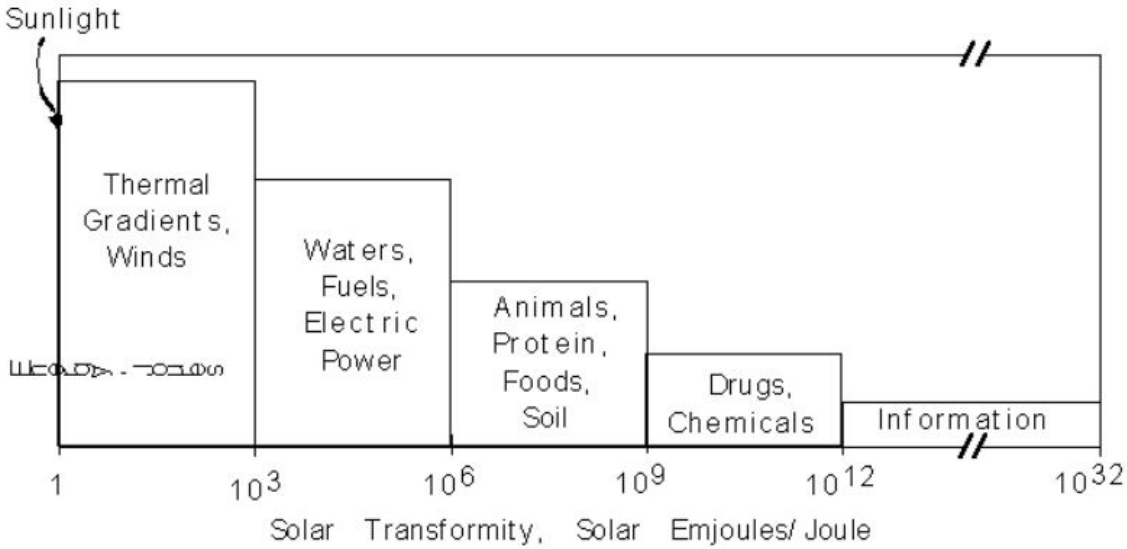
Energy



We lose energy when we convert from different sources.

Figure 4. from Emergy Evaluation (link)

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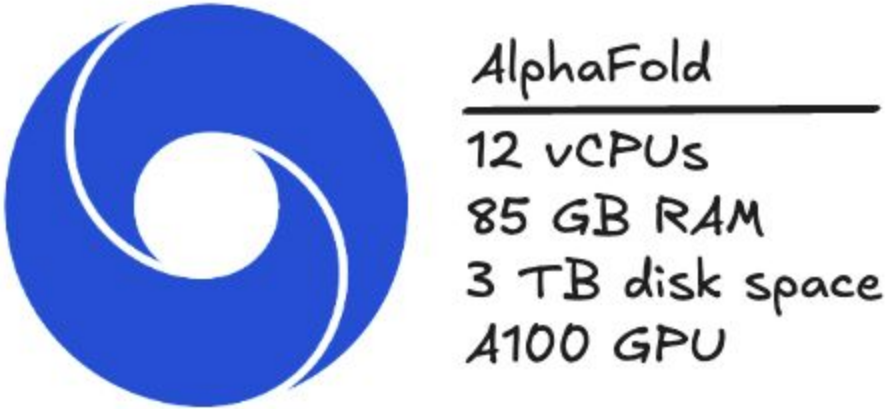
Energy



How much energy does it take to run AlphaFold?

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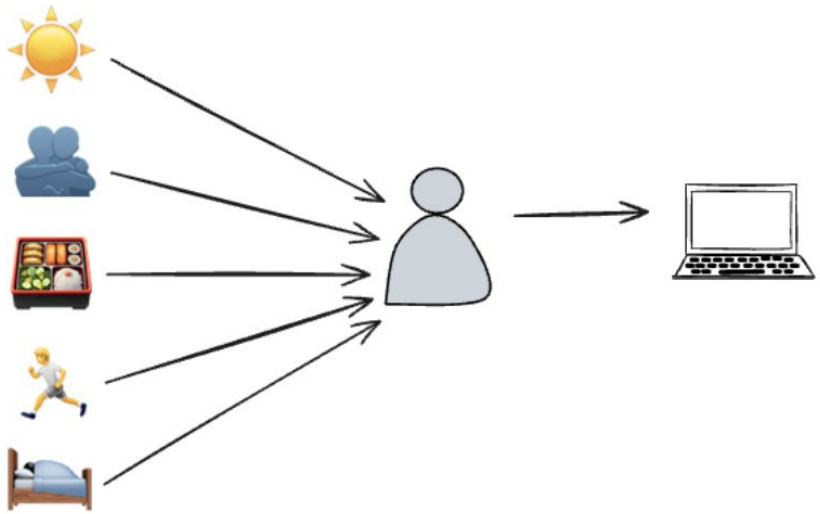
Energy



How much energy does it take to run you?

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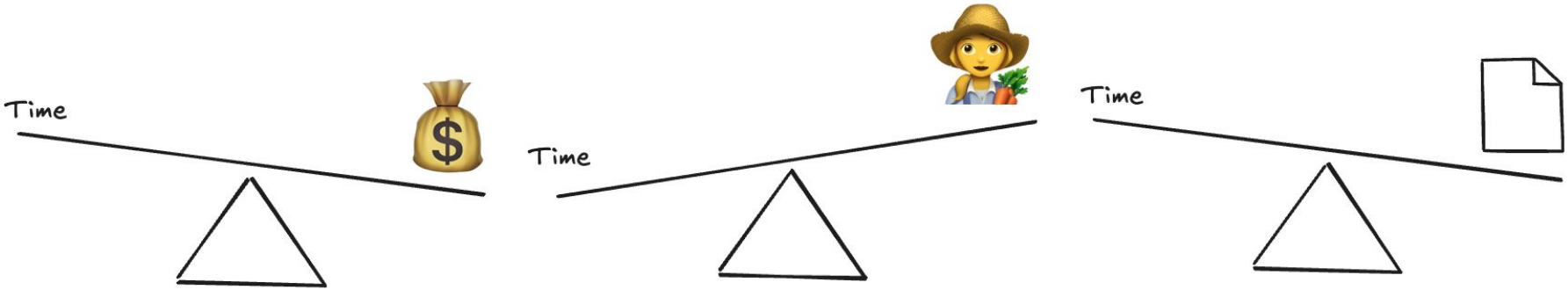
Energy



We’re usually balancing several forms of energy.

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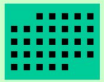
Energy

	Urgent	Not urgent
Important	Quadrant I Emergencies  DO	Quadrant II Planning  SCHEDULE
Not important	Quadrant III Interruptions  DELEGATE	Quadrant IV Time-wasters  ELIMINATE

We can decide about actions using **importance** and **urgency**.

Eisenhower Box (link)

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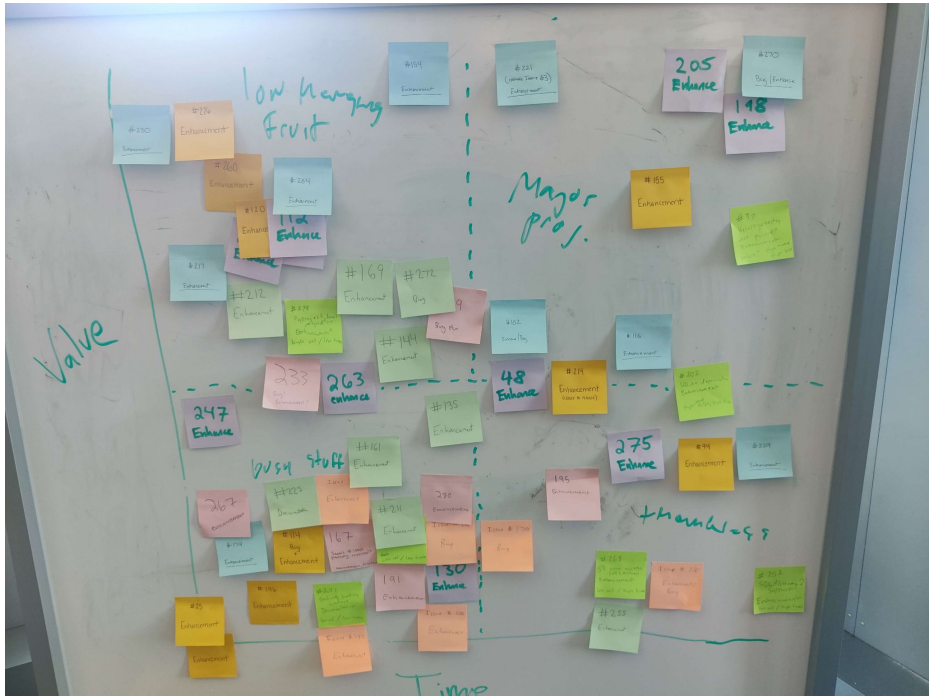
Energy



Real-world example

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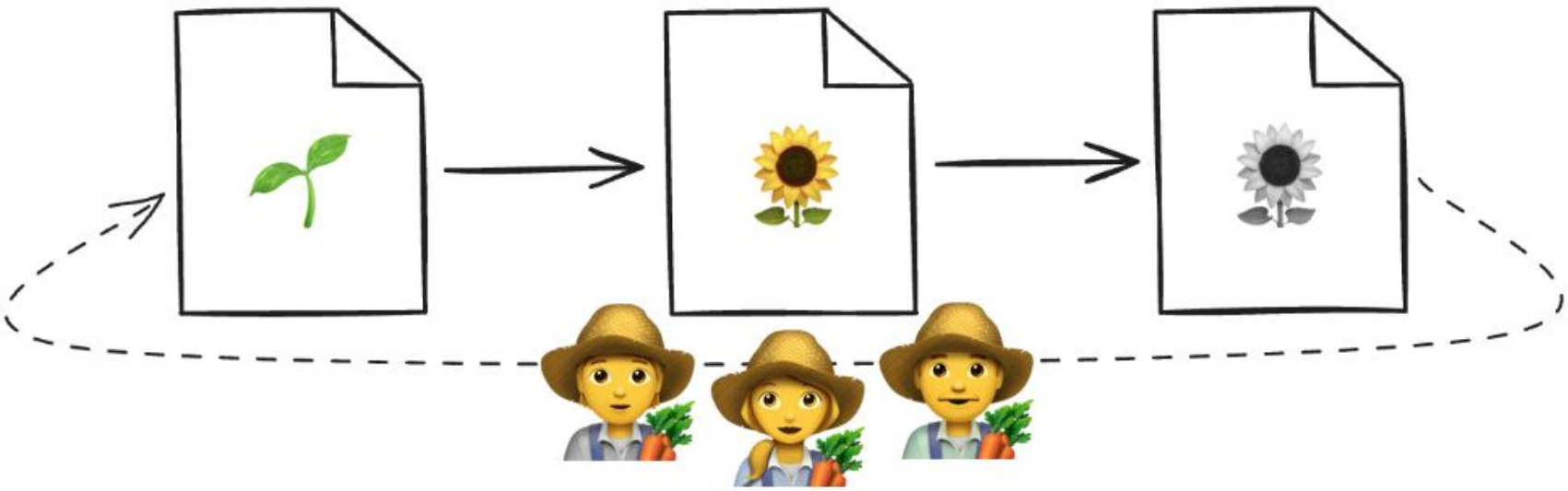
Gardening lattice



We don’t have to go it alone.

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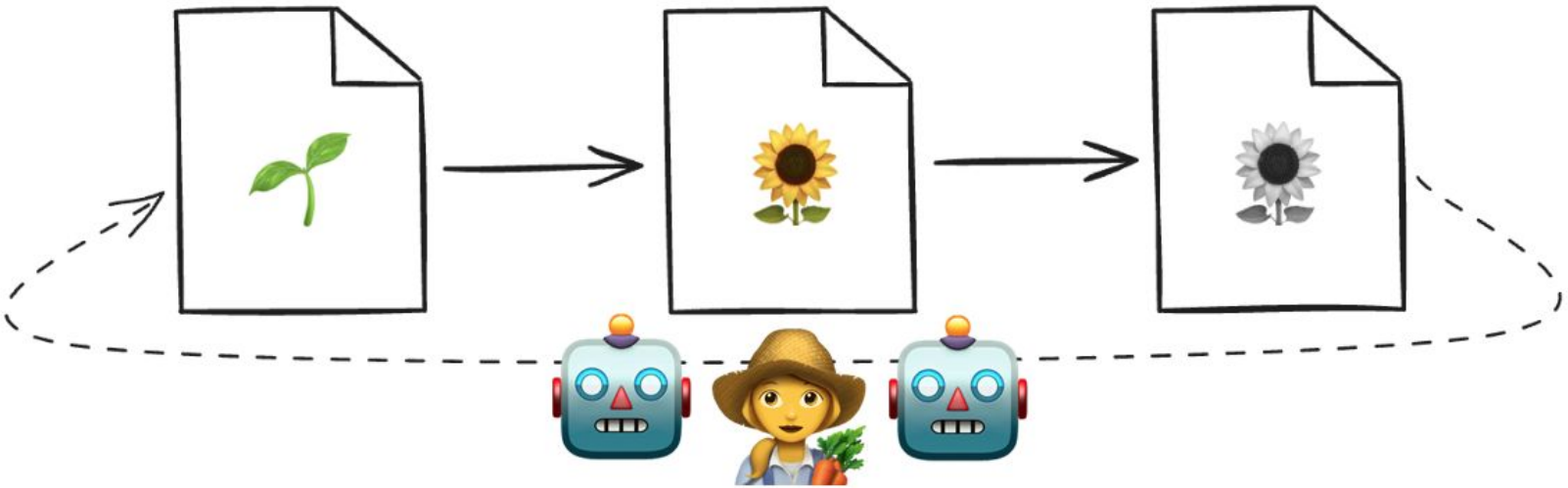
Gardening lattice



Agents can help too!

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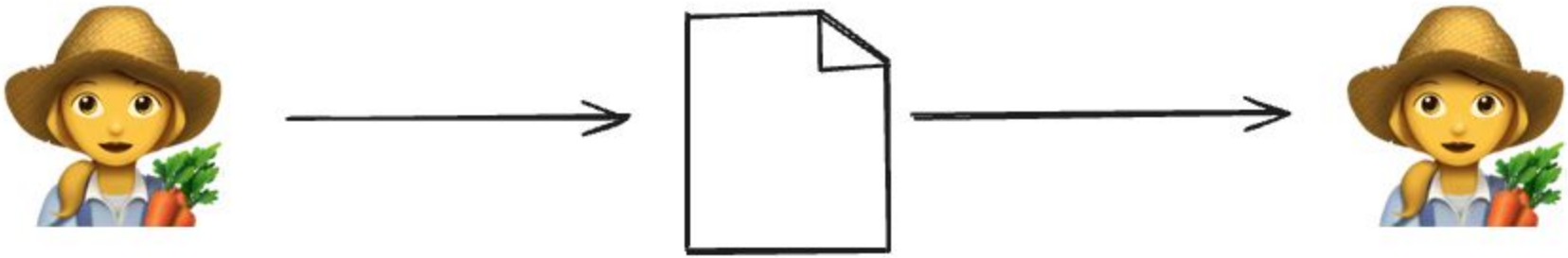
Gardening lattice



What we create will be inherited by others.

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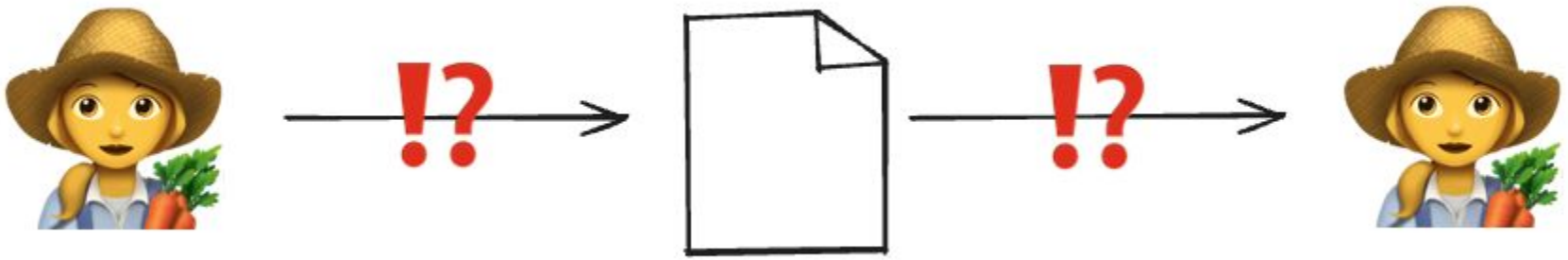
Gardening lattice



We can choose to leave a mess.

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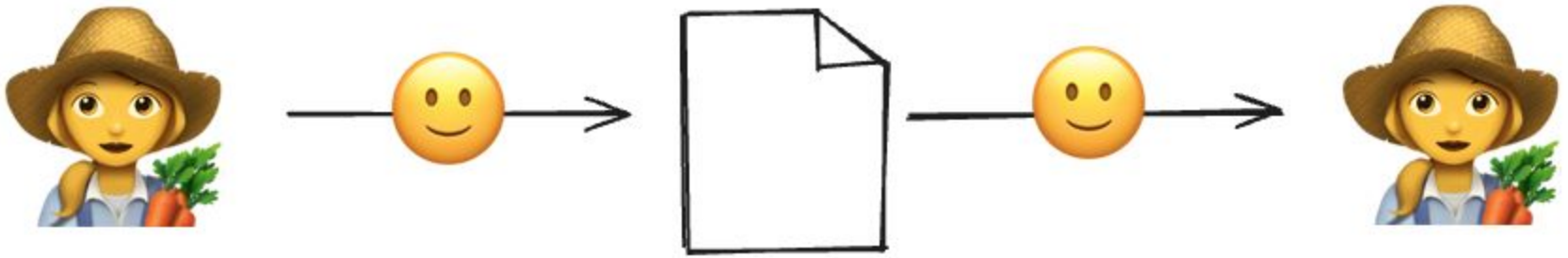
Gardening lattice



Or we can pass along kindness.

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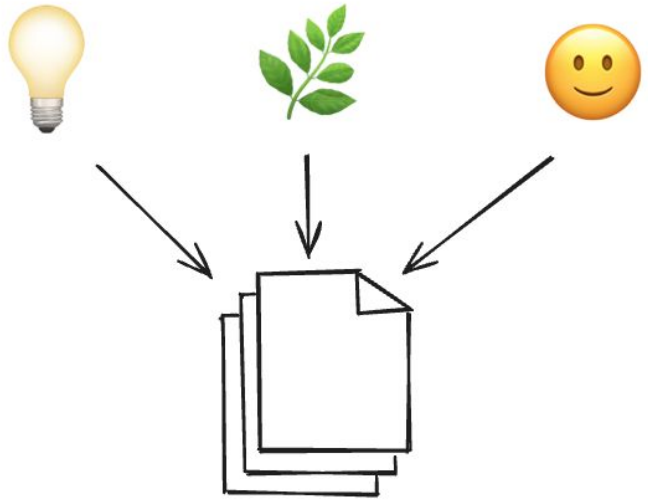
Gardening lattice



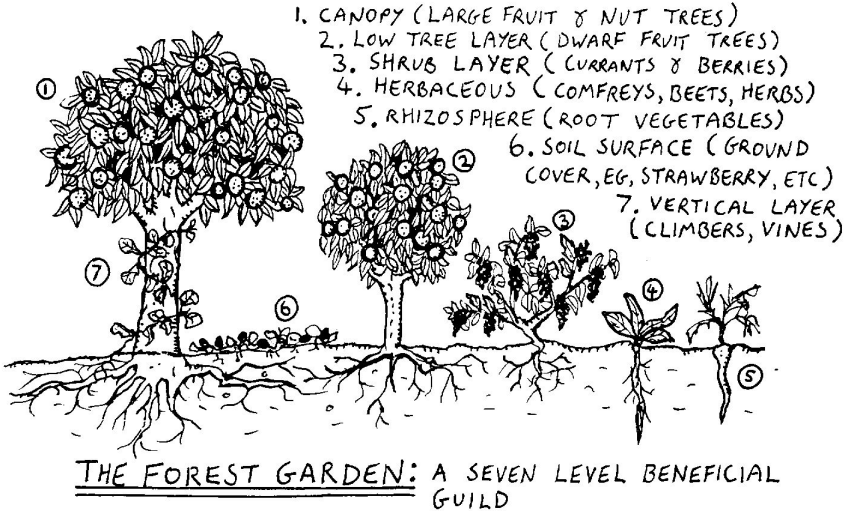
We all will find ourselves between
decisions on ideas, weeds, and joy.

Gardening lattice

"Before you speak ask yourself if what you are going to say is **true**, is **kind**, is **necessary**, is **helpful**. If the answer is no, maybe what you are about to say should be left unsaid."
- Bernard Meltzer

Software Gardening

Software forest



The garden forest: [re]balancing ecological interchange

Figures: left, right

Software Gardening

Software forest

Files: 2,617
Commits: 35,707
Issues: ~3,500
Open pull requests: 74
Closed pull requests: 32,911
Forks: ~18,000

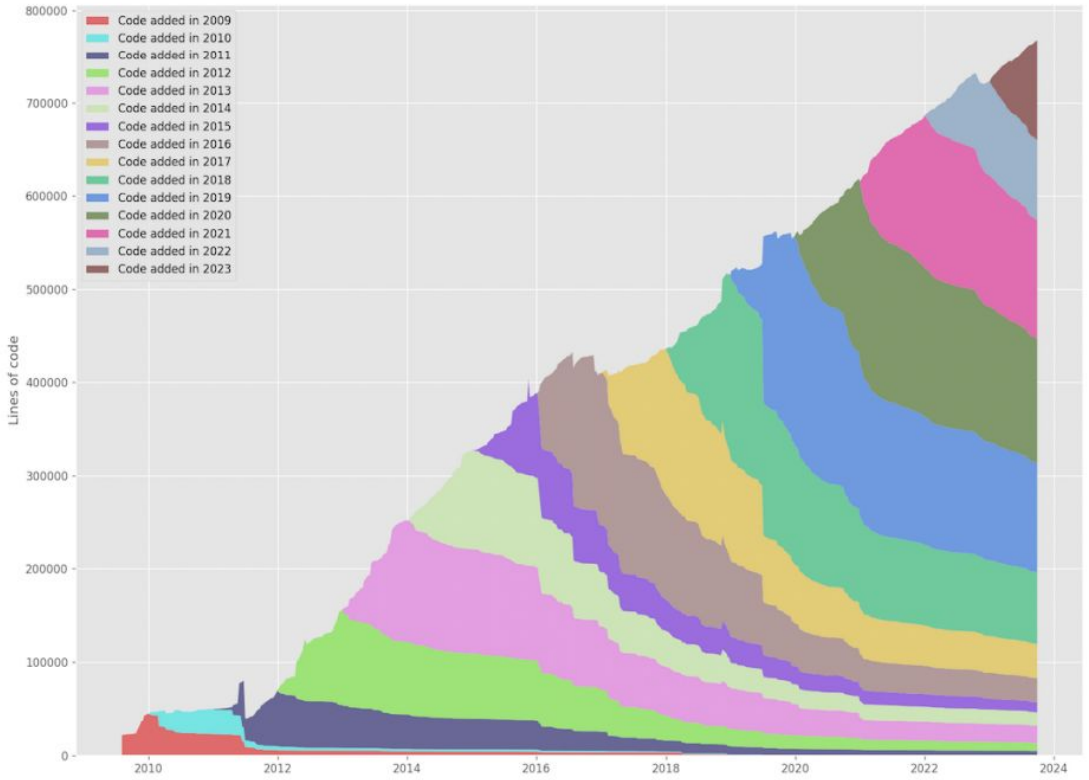
One person’s garden is another’s wilderness.

Software Gardening

Software forest

Git-of-theseus analysis for Pandas.

Was any of the code unnecessary?



Software Gardening
Software forest

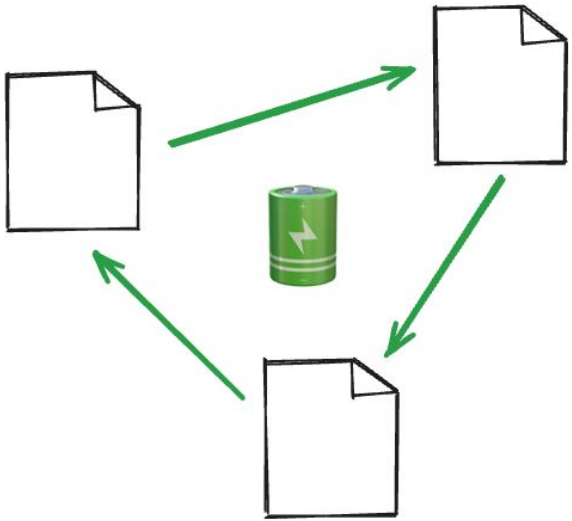
Figure: left

Replacement vs repair
"*Large-lump development is based on the fallacy that it is possible to build perfect buildings. Piecemeal growth is based on the healthier and more realistic view that mistakes are inevitable.*"

- Christopher Alexander, The Oregon Experiment

Software Gardening

Software forest



Incremental movement means energy transfer.

Software gardening demonstration

Break (5 min)

Assignment

Cultivating the Course Garden