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PVPMC Workshop

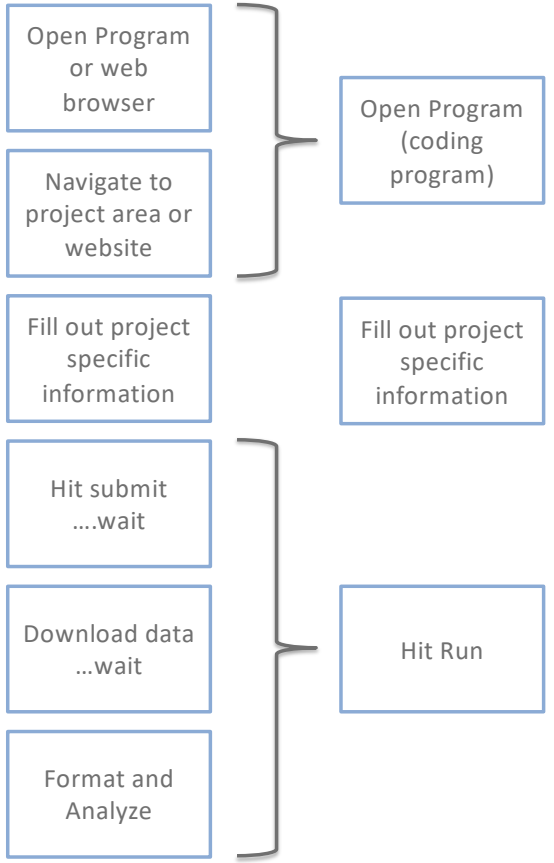
Automating the Solar Resource and Production Assessment

Intro

- Automating solar production analyses
  - What are we doing: cutting out some busy work
  - Why are we doing it: to get more information, earlier in the process
  - How are we doing it: python and python accessible software packages
  - Other applications: pipeline assessments, research & methodology updates, and more!

Background

- Key definitions
  - API (Application Programming Interface)
  - SDK (Software Development Kit)
    - ways to interact with a tool through a programming language (python!)
- Why do I care?
  - Button pushing is a waste of *everyone's* time
    - Meteorologist
    - Developer
    - Engineering
    - Capitol Estimating
    - Investment Office



Use Cases

- Automated solar resource and energy assessment
  - Get more information, earlier in the design process, to make more informed decisions
    - Site selection
    - Financing approval to continue project development
    - Design optimization, sensitivity, and risk

Use Cases

- How we currently make these decisions:
  - Resource comparison
    - Fast
    - No technology assumptions required
    - Available open-source options
    - Tools exist (e.g. Solar Resource Compass)
    - **It's a proxy for production. A good proxy, but still a proxy**
  - Production comparison
    - Higher fidelity
    - Must make technology assumptions
    - **It's more time intensive, so you are limited in the number of options you can explore**

The Process

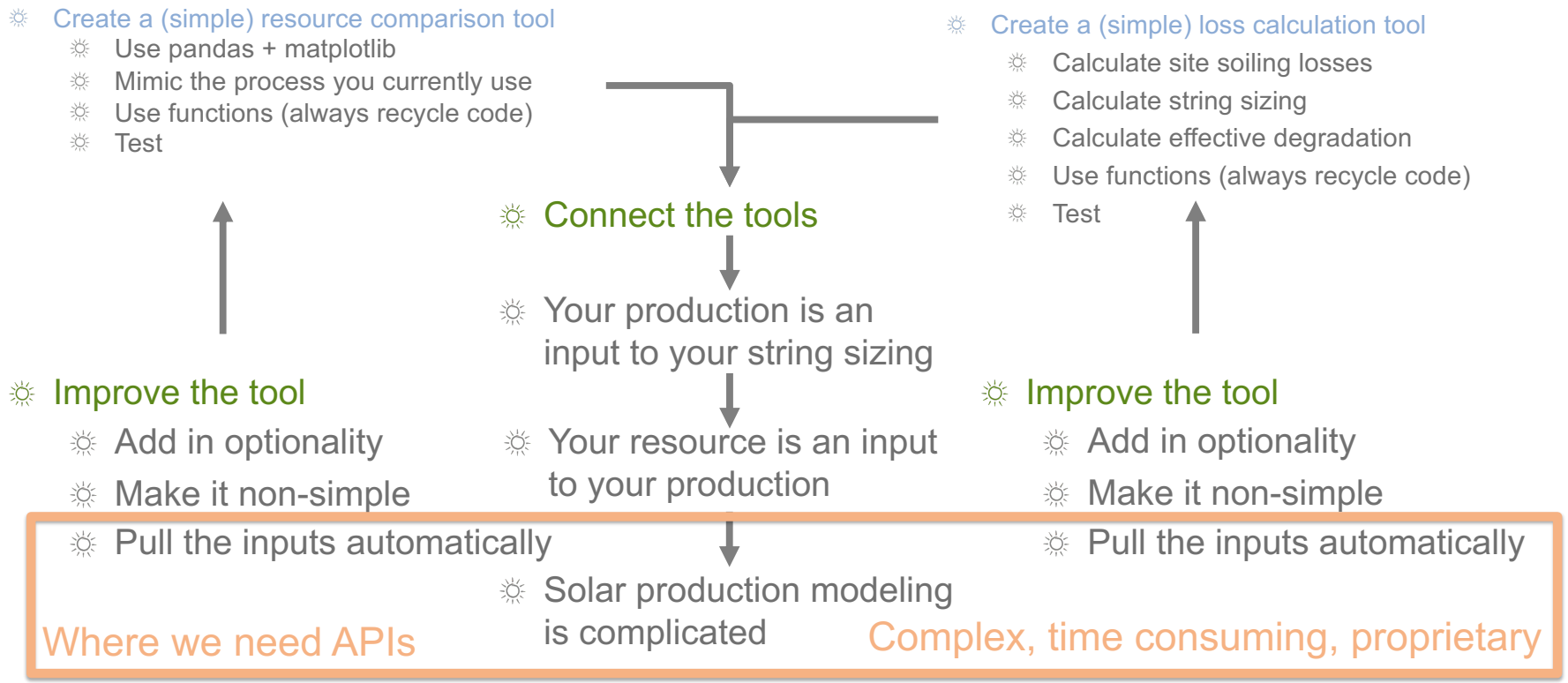
- That's a big project
  - Deep breath
  - Start small
  - Get help
    - Another team member
    - Make friends in IT
    - A family member
- I'm not a computer programmer

- Start Smaller
  - Take a class to learn the basics
    - Take the full class, don't cherry pick sections
    - I highly recommend Codecademy
      - Learn Python 2 class: free
      - Learn Python 3 class: $20 – 40 / month

- Figure out how to load your company's chosen data sources
  - Use pandas
  - Use functions (always recycle code)

- Create a (simple) resource comparison tool
  - Use pandas + matplotlib
  - Mimic the process you currently use
  - Use functions (always recycle code)
  - Test
- Create a (simple) loss calculation tool
  - Calculate site soiling losses
  - Calculate string sizing
  - Calculate effective degradation
  - Use functions (always recycle code)
  - Test

The Process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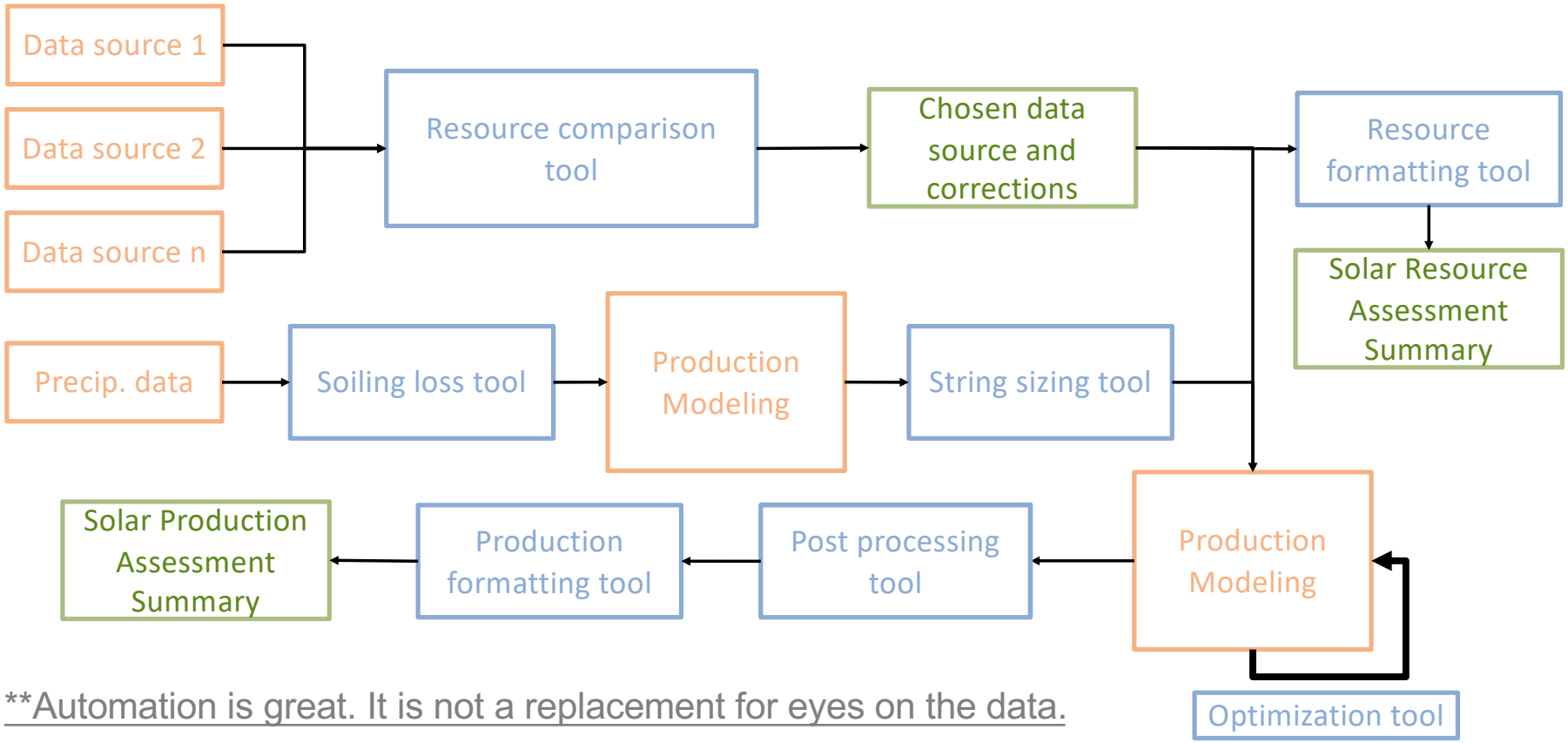
Mimic the process you currently use
Use functions (always recycle code)
Test
Create a (simple) loss calculation tool
Calculate site soiling losses
Calculate string sizing
Calculate effective degradation
Use functions (always recycle code)
Test
Connect the tools
Your production is an input to your string sizing
Your resource is an input to your production
Solar production modeling is complicated
Improve the tool
Add in optionality
Make it non-simple
Pull the inputs automatically
Improve the tool
Add in optionality
Make it non-simple
Pull the inputs automatically
Where we need APIs
Complex, time consuming, proprietary

The Process



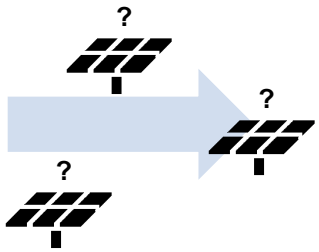
**Automation is great. It is not a replacement for eyes on the data.

Time Saving

- Automated solar resource and energy assessment
  - Get more information, earlier in the design process, to make more informed decisions

Manual Assessments	Automated assessments
Solar Resource Assessment (3 hrs)	← (minutes)
Loss calculations (2 hrs)	← (seconds)
Optimization (1-2 hrs)	← (minutes)
Final modeling and processing (1 hr)	← (seconds)

- Resource comparison



- Detailed production comparison

Conclusions and continuances

- Solar developers:
  - You do not need a computer science degree to automate your processes
  - Automation → more information earlier in the process → more informed decision making
  - Blind automation → bad data
  - There are other useful applications for automated solar assessments
    - Pipeline analysis
    - Combination with financial modeling
    - Methodology studies and modeling research

- Software, data, and tool providers:
  - Most of you already provide programmatic access to the products you sell, and I really appreciate that

Thank you!

Special Acknowledgements:

Questions?

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