pvlib python
Updates and Users Group Meeting

2024 PVPMC Workshop
Salt Lake City
May 9, 2024

pvlib python since last year
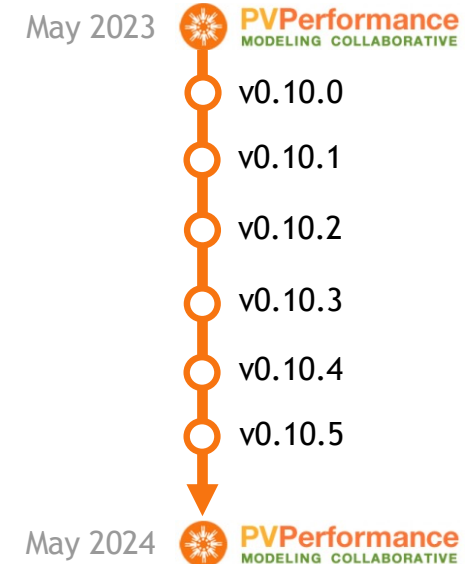
- Since v0.9.6: ~130 PRs merged, ~50 total contributors

- Selected improvements:
  - pvlib.iotools: Solargis, Solcast, Solaranywhere, horizon profile, precipitation, snowfall
  - Irradiance: Louche, Orgill-Hollands, Perez-Driesse, Erbs-Driesse
  - 2-D view factor functions
  - Faster SPA
  - IAM parameter fitting and conversion functions
  - Compatibility with pandas 2.0 and numpy 2.0

- Many bugfixes & documentation improvements

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v0.10.0
v0.10.1
v0.10.2
v0.10.3
v0.10.4
v0.10.5

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Full details: https://pvlib-python.readthedocs.io/en/stable/whatsnew.html

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pvlib python: 2023 project update

Kevin S. Anderson [*1], Clifford W. Hansen [1], William F. Holmgren [2], Adam R. Jensen [3], Mark A. Mikofski [2], and Anton Driesse [4]

1 Sandia National Laboratories 2 DNV 3 Technical University of Denmark 4 PV Performance Labs

Summary

pvlib python is a community-developed, open-source software toolbox for simulating the performance of solar photovoltaic (PV) energy components and systems. It provides reference implementations of over 100 empirical and physics-based models from the peer-reviewed scientific literature, including solar position algorithms, irradiance models, thermal models, and PV electrical models. In addition to individual low-level model implementations, pvlib python provides high-level workflows that chain these models together like building blocks to form complete "weather-to-power" photovoltaic system models. It also provides functions to fetch and import a wide variety of weather datasets useful for PV modeling.

pvlib python has been developed since 2013 and follows modern best practices for open-source python software, with comprehensive automated testing, standards-based packaging, and semantic versioning. Its source code is developed openly on GitHub and releases are distributed via the Python Package Index (PyPI) and the conda-forge repository. pvlib python's source code is made freely available under the permissive BSD-3 license.

Here we (the project's core developers) present an update on pvlib python, describing capability and community development since our 2018 publication (Holmgren, Hansen, & Mikofski, 2018).

Statement of need

PV performance models are used throughout the field of photovoltaics. The rapid increase in

https://doi.org/10.21105/joss.05994

Solar Energy
Volume 266, December 2023, 112092

Data article

pvlib iotools—Open-source Python functions for seamless access to solar irradiance data

Adam R. Jensen [a], Kevin S. Anderson [b], William F. Holmgren [c], Mark A. Mikofski [c], Clifford W. Hansen [b], Leland J. Boeman [d], Roel Loonen [e]

Highlights

- Open-source Python functions for reading and retrieving irradiance data.
- Standardized functions ensure seamless switching between data providers.
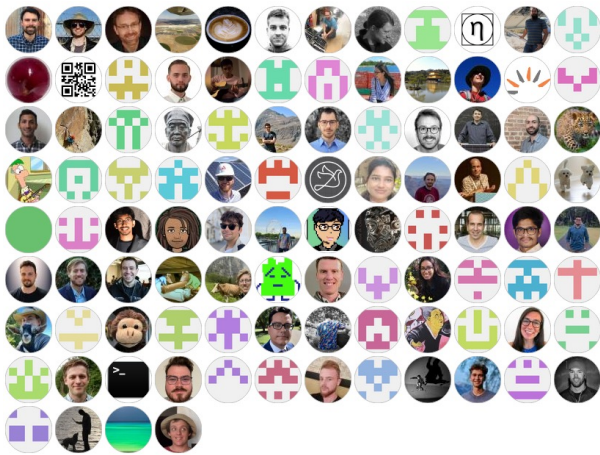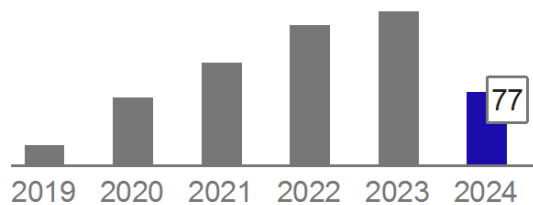- Support for retrieving data from 12 open solar irradiance datasets.
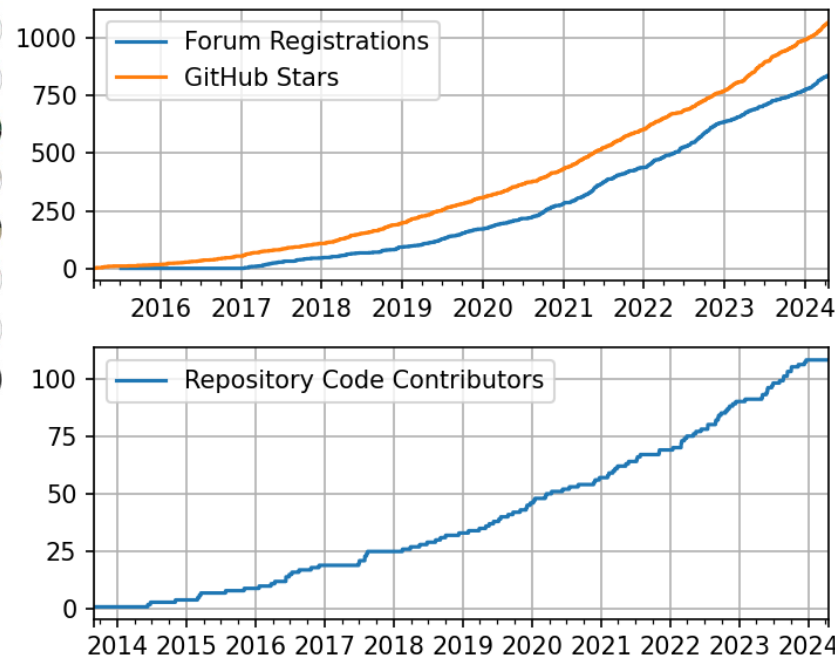
https://doi.org/10.1016/j.solener.2023.112092

Real-world usage

Image: BayWa r.e.

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Project

110+ GitHub contributors

Cited by 580

2018 pvlib-python JOSS paper
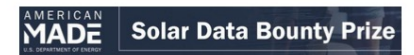
Data prize webinar material
https://pv-tutorials.github.io/

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Google Summer of Code

May 27 - August 26

Shading & Spectrum
Echedey Luis

- Row-to-row shade loss
- Reduced-order EMM model
- PAR model
- Reference spectra and PV SR/QE curves
- Documentation

Floating PV
Ioannis Sifnaios

- FPV thermal models
- Water albedo model
- Water wind speed model
- Documentation

Spectral corrections
Rajiv Daxini

- Several spectral correction models
- Documentation

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What would Adam and Kevin like to see

Functionality

- Shading

- Inverter operating ranges

- Transformers

- SAT improvements

- "interfaces" – e.g. transposition models return isotropic, circumsolar, horizon

Documentation

- Long-awaited documentation overhaul

- Alternatives comparison tables: various model types, iotools datasets

- Roadmap

- pvlib.org

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Project growth

Project

- Governance
  - How to get commit rights
  - How to decide whether a PR is suitable for pvlib
  - How to manage community resources (domains, funding, etc.)

- Deprecation/support policy

- Periodic tasks
  - Update roadmap
  - Evaluate "dead batteries" in pvlib

- Strategy for recruiting developers & maintainers

- Regular community calls

- "Steering council"?

- NumFOCUS sponsorship?

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Community Discussion

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Hackathon

- Begin your first PR?

- Tutorial content
  - https://pv-tutorials.github.io

- Topic-focused tables

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Community Discussion

- show how to open an issue. that gets their foot in the door, and we can help them from there
- show how to fix a typo in a PR
- **how can we make it easier/more accessible to be part of the community? do you guys feel part of it? what are the barriers?**
- what are the requirements for something to be added to pvlib?
- ~~governance~~?
- josh: PVPMC quickstart guide?

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