Notebooks Now: Introduction to Quarto

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What is Quarto?

Quarto is an open-source scientific and technical publishing system that builds on standard markdown with features essential for scientific communication.

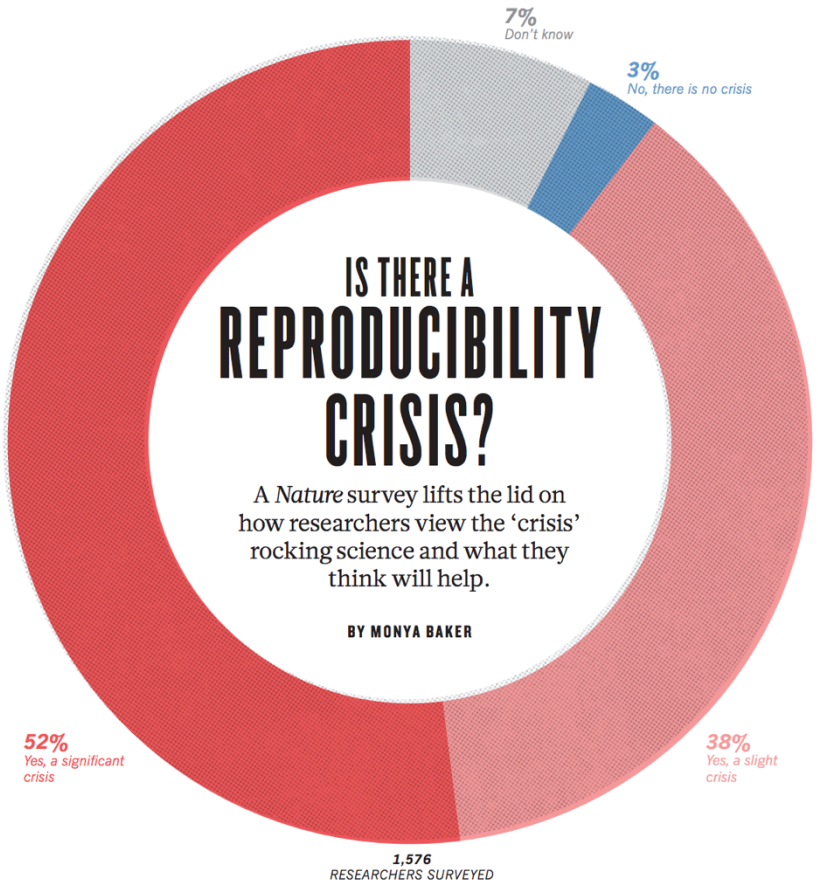
- Computations: Python, R, Julia, Observable JS
- Markdown: Pandoc w/ many enhancements
- Output: Documents, presentations, websites, books, blogs

Literate programming system in the tradition of Org-mode, Sweave, Weave.jl, R Markdown, iPyPublish, Jupyter Book, etc.

Origins

- Open source project sponsored by Posit, PBC (formerly RStudio, PBC)
- 10 years of experience with R Markdown (a similar system that was R-specific) convinced us that the core ideas were sound.
- The number of languages and runtimes used for scientific discourse is very broad.
- Quarto is a ground-up re-imagining of R Markdown that is fundamentally multi-language and multi-engine.

Goal: Computational Documents



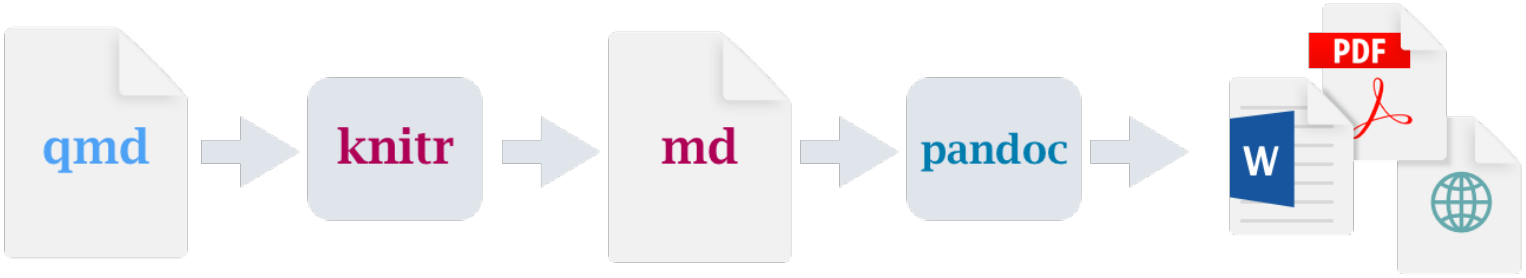
- Documents that incorporate the source code required for their production
- Notebook and plain text flavors
- Automation and reproducibility

Computational Engines

Quarto has a pluggable computation system that allows for compatibility with today's standards along with the ability to evolve to work with new standards:

- Knitr
- Jupyter
- Observable JS
- Others possible…

Knitr Engine



For R, Quarto still uses Knitr under the hood. Consequently, ***the vast majority of existing Rmd files*** can be rendered unmodified.

Knitr Engine

````
---
title: "ggplot2 demo"
author: "Norah Jones"
date: "5/22/2021"
format:
  html:
    fig-width: 8
    fig-height: 4
    code-fold: true
---

## Air Quality

@fig-airquality further explores the impact of
temperature on ozone level.

```{r}
#| label: fig-airquality
#| fig-cap: Temperature and ozone level.
#| warning: false

library(ggplot2)

ggplot(airquality, aes(Temp, Ozone)) +
  geom_point() +
  geom_smooth(method = "loess"
)
```
````

ggplot2 demo

Norah Jones

May 22nd, 2021

Air Quality

Figure 1 further explores the impact of temperature on ozone level.

▶ Code

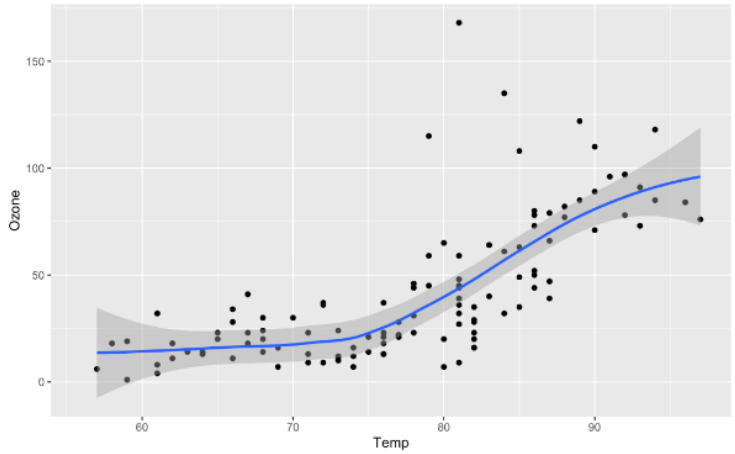


Figure 1: Temperature and ozone level.

Jupyter Engine — ipynb

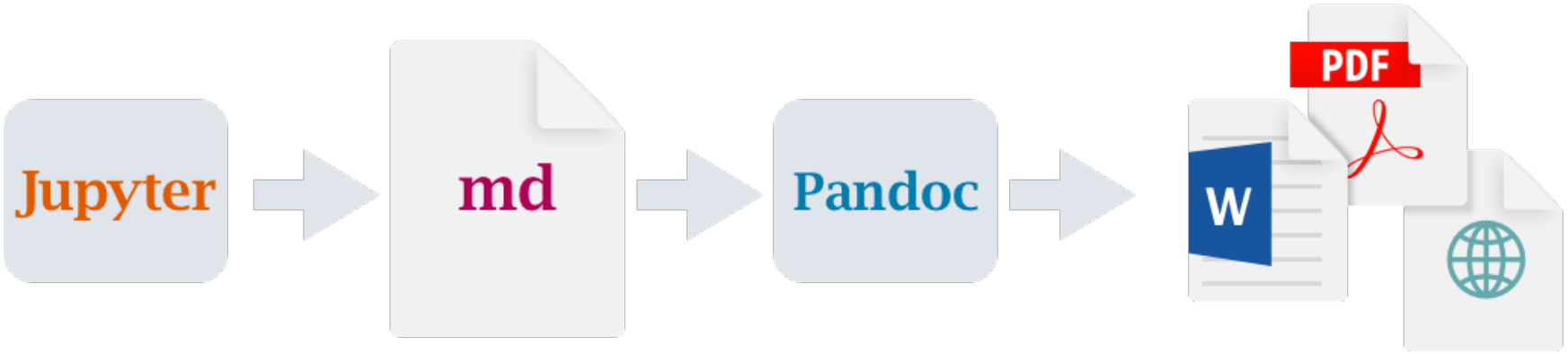
Use with any language that has a Jupyter kernel (Python, Julia, R, many others…). Supports two input file formats:

- Traditional notebooks (`.ipynb`)
- Markdown w/ chunks (`.qmd`)

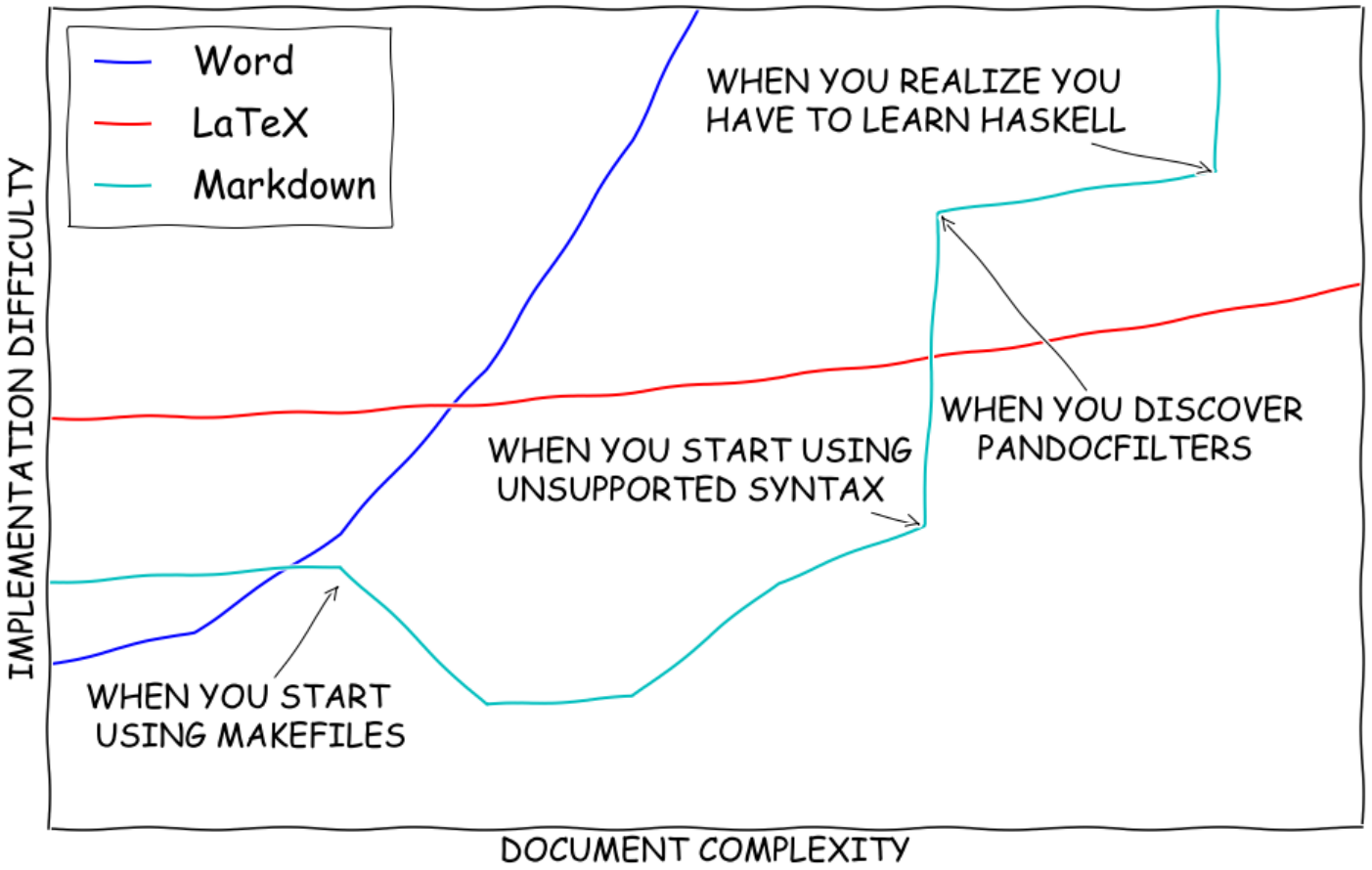
Hello Jupyter: https://quarto.org/#hello-quarto

Jupyter Engine: ipynb

You can also render Jupyter notebooks (`.ipynb` files) directly. Note that in this case no execution occurs by default:



Goal: Scientific Markdown

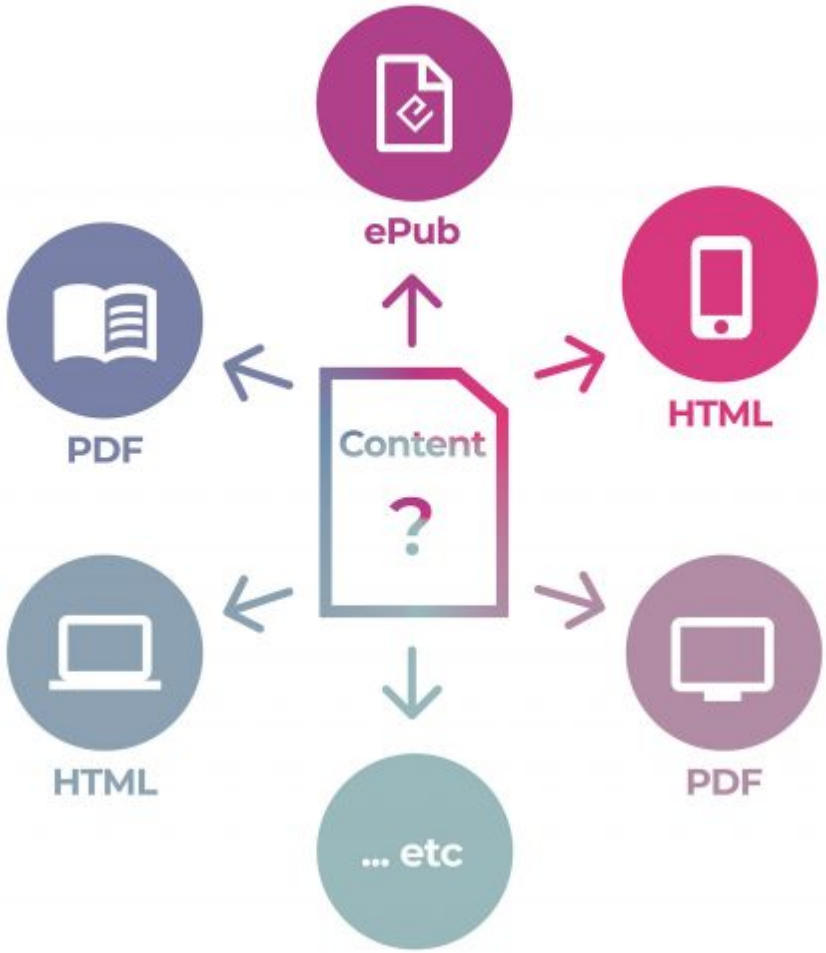


Markdown Extensions

- Citations
- Cross references
- LaTeX math
- Diagrams
- Figure panels
- Callouts
- Advanced page layout

Goal: Single Source Publishing

https://coko.foundation/articles/single-source-publishing.html



Publishing Formats

- Documents (HTML, PDF, Word, ODT, Ipynb, etc.)
- Presentations (HTML, PDF, PowerPoint, etc.)
- Websites & Blogs (Quarto, Hugo, Docusaurus, etc.)
- Books (HTML, PDF, Word, ePub, Asciidoc, etc.)
- Journal Articles (LaTeX, HTML, Ipynb, etc.)

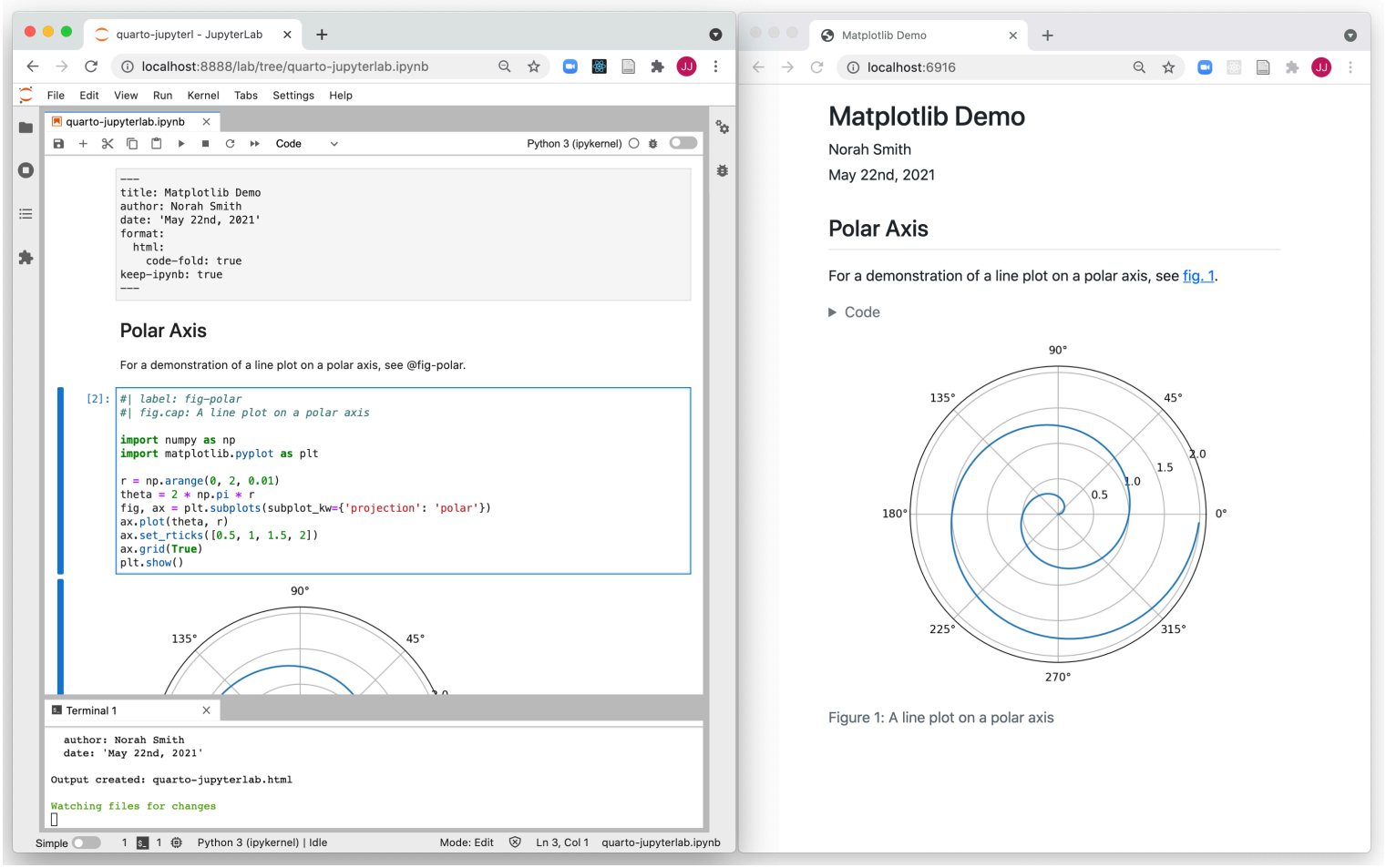
Notebooks and Quarto

Ways you might use Jupyter notebooks with Quarto:

- **Authoring**—Using notebooks as an end-to-end authoring tool for a manuscript.
- **Computations**—Using notebooks as source of reproducible computations for a manuscript.
- **Publishing**—Providing interactive supplements to manuscripts published in print or on the web.

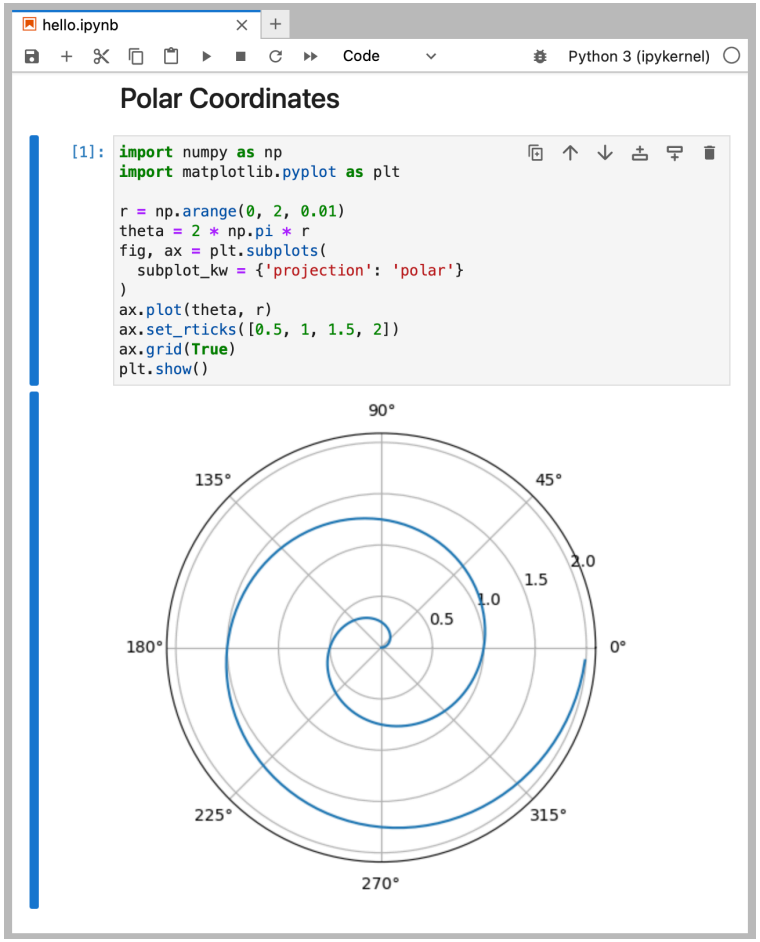
Notebook Authoring

Author the entire manuscript within a notebook editor like Jupyter Lab (side by side preview for HTML or PDF output):



Notebook Computations

- Notebook as a computational medium only (as opposed to a medium for both prose and computation)
- Staged workflow where computations are *included* within documents for publication (retaining ability to re-execute computations for reproducibility)



Notebook Computations (cont.)

Markdown document includes
figure from notebook:

```
For a demonstration of a line plot on a
polar axis, see @fig-polar.

::: {#fig-polar}

{{< include notebook.ipynb#fig-polar >}}

A line plot on a polar axis.
:::
```

Notebook Computations (cont.)

Markdown document includes
figure from notebook:

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::: {#fig-polar}

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Notebook Computations (cont.)

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A line plot on a polar axis.
:::
```

For a demonstration of a line plot on a polar axis, see Figure 1.

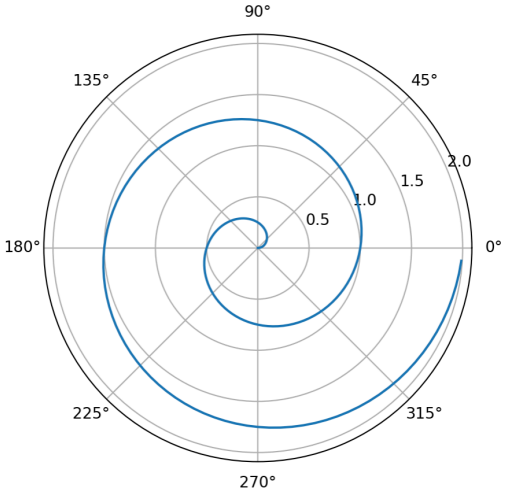

Figure 1: A line plot on a polar axis

Notebook Publishing

Create notebook output *alongside* traditional formats (LaTeX, HTML, etc.). For example, here is metadata for an American Chemical Society article that produces multiple outputs:

```yaml
format:
  acs-pdf:
    keep-tex: true
    journal:
      id: jacsat
      layout: traditional
      abbreviations: IR,NMR,UV
  acs-html:
    fig-width: 6
    fig-height: 4
  ipynb:
    fig-width: 7
    fig-height: 5
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Learning More

Slides: https://jjallaire.quarto.pub/notebooksnow-quarto/

- Getting started: https://quarto.org/
- User guide: https://quarto.org/docs/guide/
- Awesome Quarto: https://github.com/mcanouil/awesome-quarto