Data Driven Art: Local Historical Weather Patterns

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August 14, 2025

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Juniata College
PENNSYLVANIA
1876

Who am I?

- 2002 Ph.D. math, PSU, complex dynamical systems
- 2002 Wheeling (Jesuit) University
- 2006 Juniata College- start teaching stats
- 2016 Masters in Applied Statistics, PSU
- 2017 Data Science Program
- 2020 Mathemalchemy Project
- 2023 Counting Afghans
- 2025 PSU job in Statistics

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What to do when you do not have a current math project?

Think mathematical sciences

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Overview

- Weather related fabric arts
- Open Weather API and R
- Temperature Blanket heatmap
- Mini-blanket
- Future plans

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Some Weather Related Patterns

[Weather or Knot](#)
Scott Rhor

[Weather Blanket C2C Style](#)
Sarah Patrick

[Whatever the Weather Temperature Projects](#)
Stephanie Shiman

Pictures from the associated ravelry pages

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Some historical weather patterns

Champlain Ice Scarf
Michael Glennon
Part of Wool and Water

Picture from the associated ravelry page

Planetary Fever Cowl
Stefania Fregosi
(My project)

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The R code

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Huntingdon, PA
Data

Pulling lat and long for location

```{r}
location_name=c("Huntingdon, PA, USA")
loc_table=geo(
address = location_name, method="osm") #osm is nominatum

loc_coord=c(loc_table$lat,  loc_table$long) #this is kinda bad code
loc_coord

```

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Open Meteo

- Freely usable for non-commercial use
- Many weather databases including historical to 1940
- Lots of variables
- Available hourly or daily
- Has related R package

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From https://open-meteo.com

```{r}
weather_call=weather_history(
loc_coord,
start = "2019-09-01",
end = "2025-07-31",
hourly = NULL,
daily = c("temperature_2m_mean",  "wind_speed_10m_max", "wind_direction_10m_dominant",
"precipitation_hours", "precipitation_sum"),
response_units = NULL,
model = NULL,
timezone = "auto"
)

```

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Making a personal weather blanket

- Average Temp by Month
- Huntingdon, PA (where I live)
- Every 5 years since 1975 (in honor of my 50th birthday this year)

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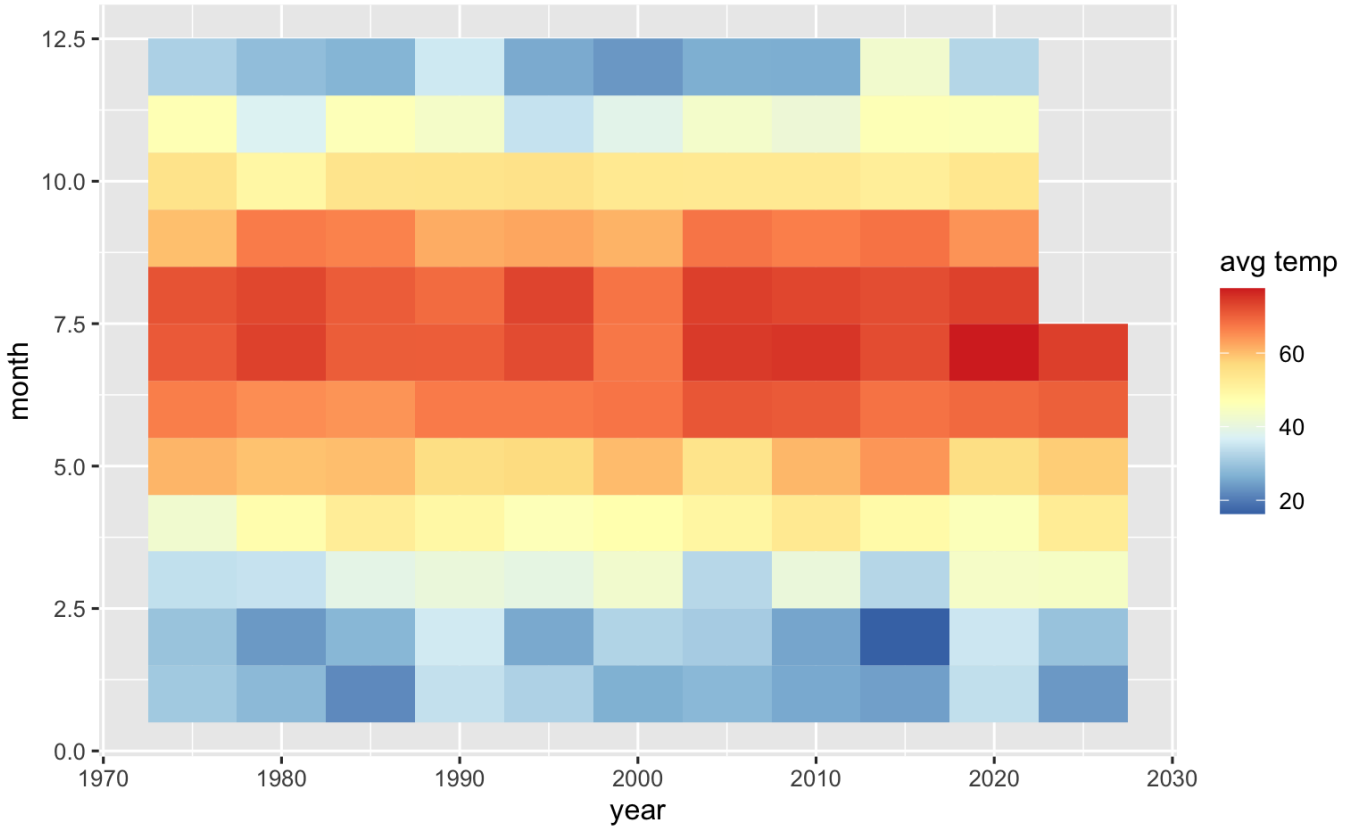
First attempt at heat map

- Layout okay
- Need to fix y axis
- Colors do not match yarn
- Too many colors



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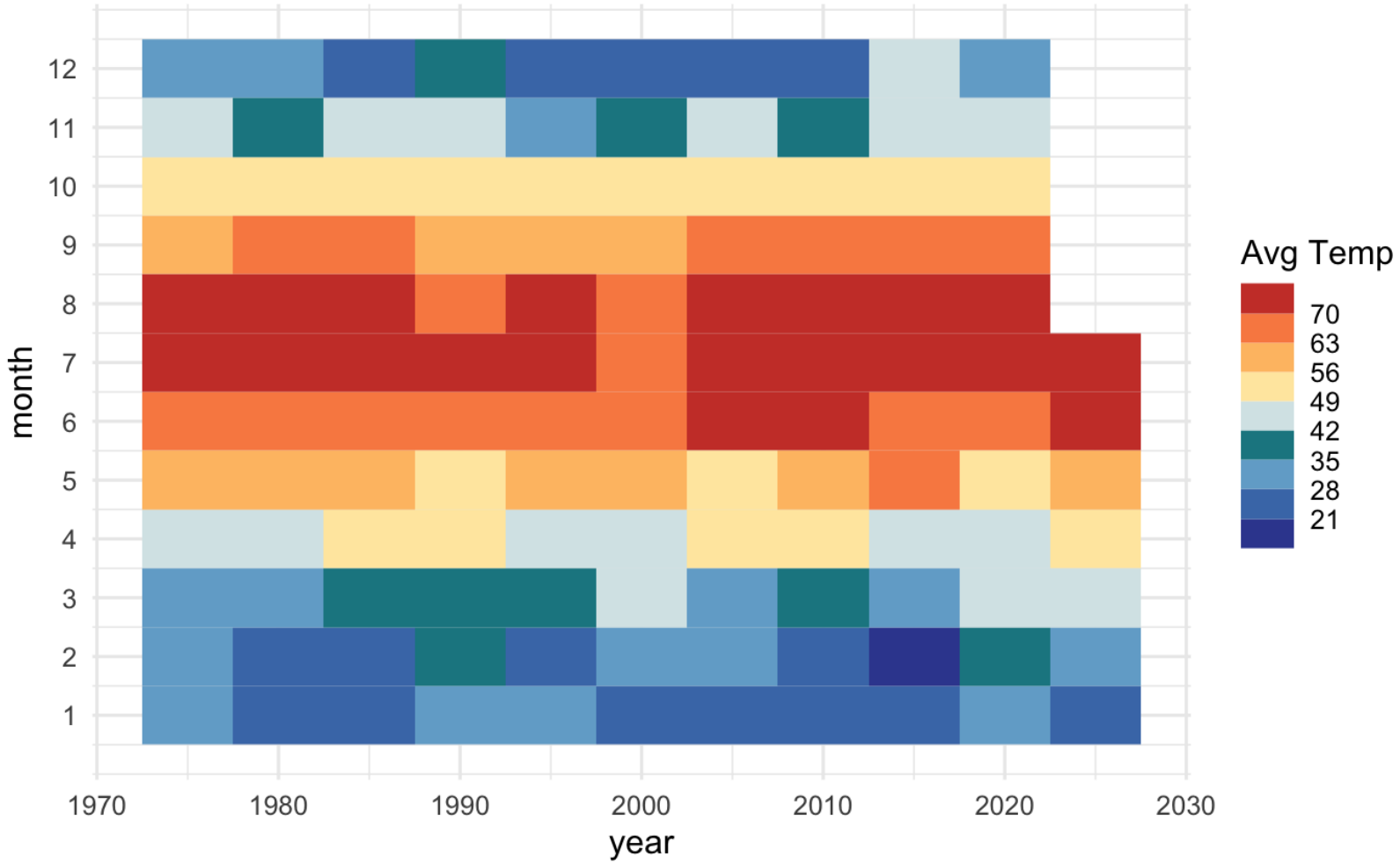
Second attempt at heat map



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Miniblanket: First Draft

Ravelry project

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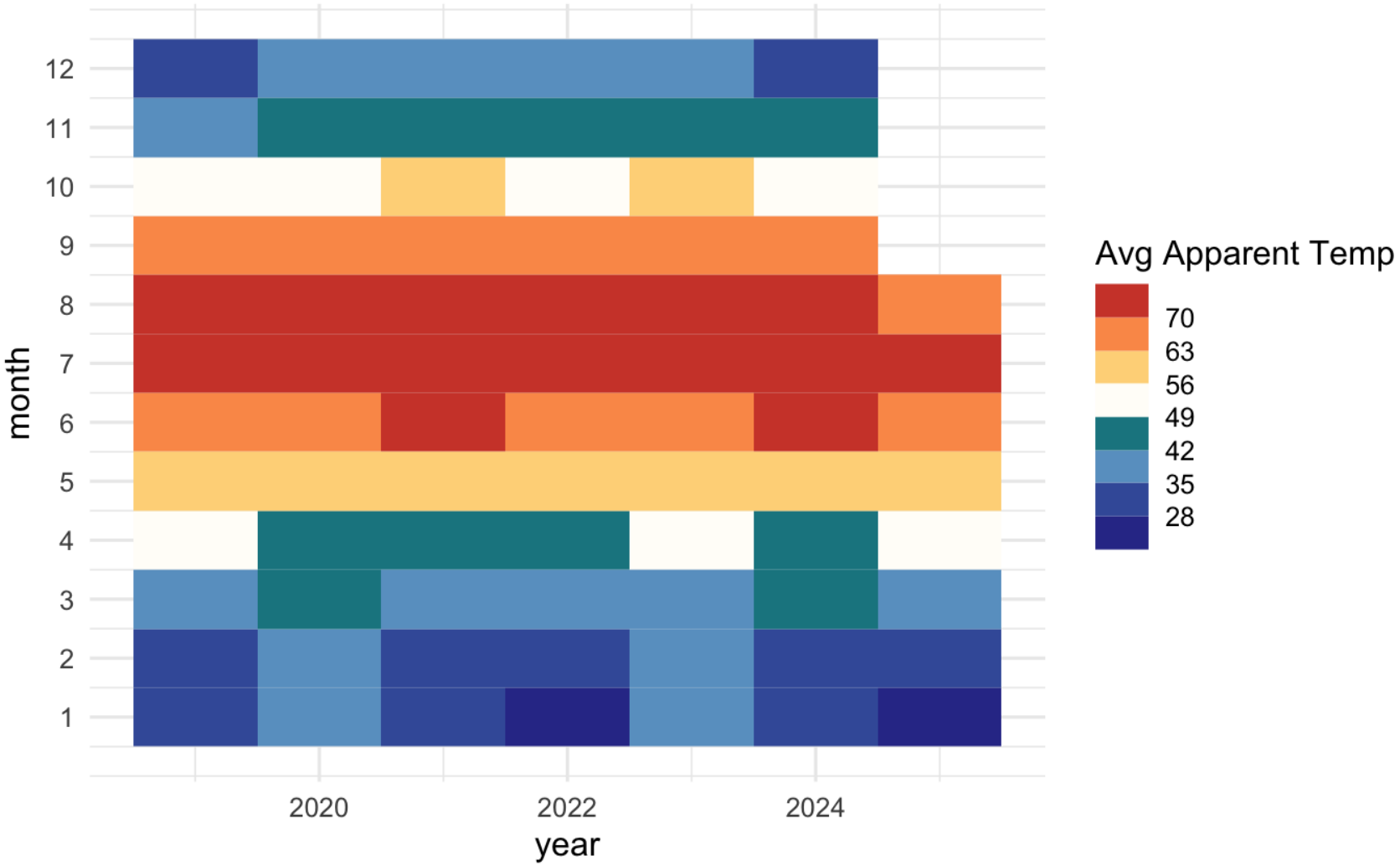
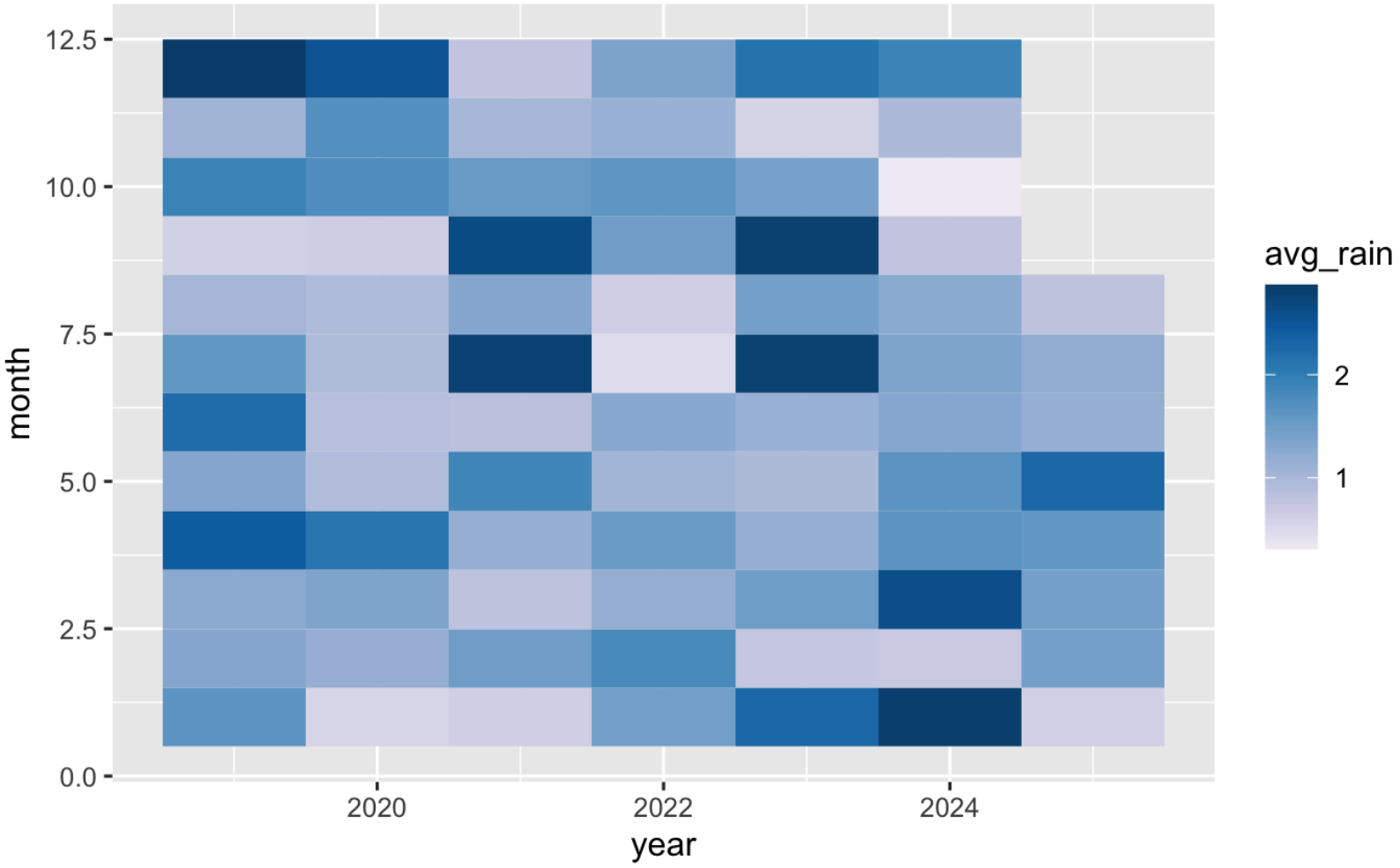
What you can customize

- Location
- Weather Statistic
- Duration(years, months, days)
- Colors
- Layout

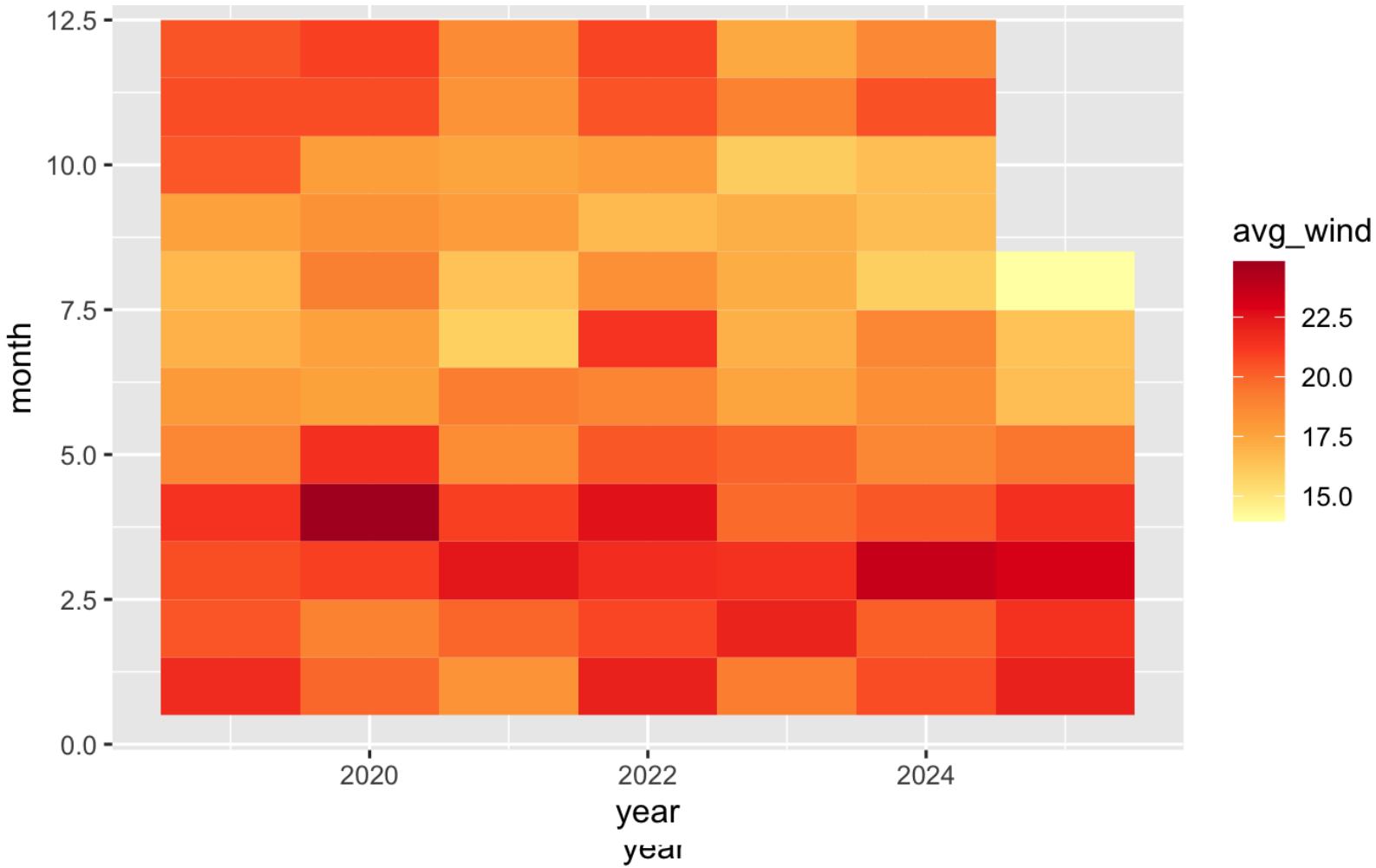
Providence RI



Providence RI



Providence RI



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Future plans

- Finish 2025 data and finish project
- Play around with various blankets related to parts of my life/my ancestor's history.
- Add code that generates a knitting pattern based on the user preferences
- Adapt code to be an Rshiny app

```
+ )
```

```
Error in curl::curl_fetch_memory(url, handle = handle) :
  Transferred a partial file [archive-api.open-meteo.com]: transfer closed with outstanding read data remai
ning
```

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Live coding

If time permits

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Need from you

- Location
- Dates to get data/graph
- Weather variable

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Need from you

- Location
- Time frame
- Weather variable
- Color preferences

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Weather variables

weathercode

temperature_2m_mean

temperature_2m_max

temperature_2m_min

apparent_temperature_mean

apparent_temperature_max

apparent_temperature_min

sunrise

sunset

daylight_duration

sunshine_duration

precipitation_sum

rain_sum

snowfall_sum

precipitation_hours

max_windspeed_10m

max_windgusts_10m

dominant_winddirection_10m

shortwave_radiation_sum

reference_evapotranspiration

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Thank you.

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https://karoth.github.io

https://mathemalchemy.org

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Shadow the Scientists

SHADOW.UCSC.EDU

About

The Shadow the Scientists (StS) initiative aims to offer immersive virtual learning experiences that spark students' interest in STEAM careers and build the essential skills and knowledge needed for success in these fields.

We also host sessions for the public to foster community awareness and appreciation for the vital research happening across STEAM fields.

Our sessions allow participants to engage with university and industry professionals while exploring how STEAM topics relate to real-world issues and community challenges.

New sessions are added to our website each month!

Watch previous sessions on our YouTube channel

Session Topics Include:

- Astronomy
- Biology
- Ecology
- Geology
- Heliophysics
- Marine Science

Do you want to schedule a session for your class or organization?

It's easy! Contact Jameeka Marshall, the Shadow the Scientists Programs Manager:

jmarsha4@ucsc.edu

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