

Visualizing Climate Change & Building a Climate Model

By Muttaqi Ahmad Alladin

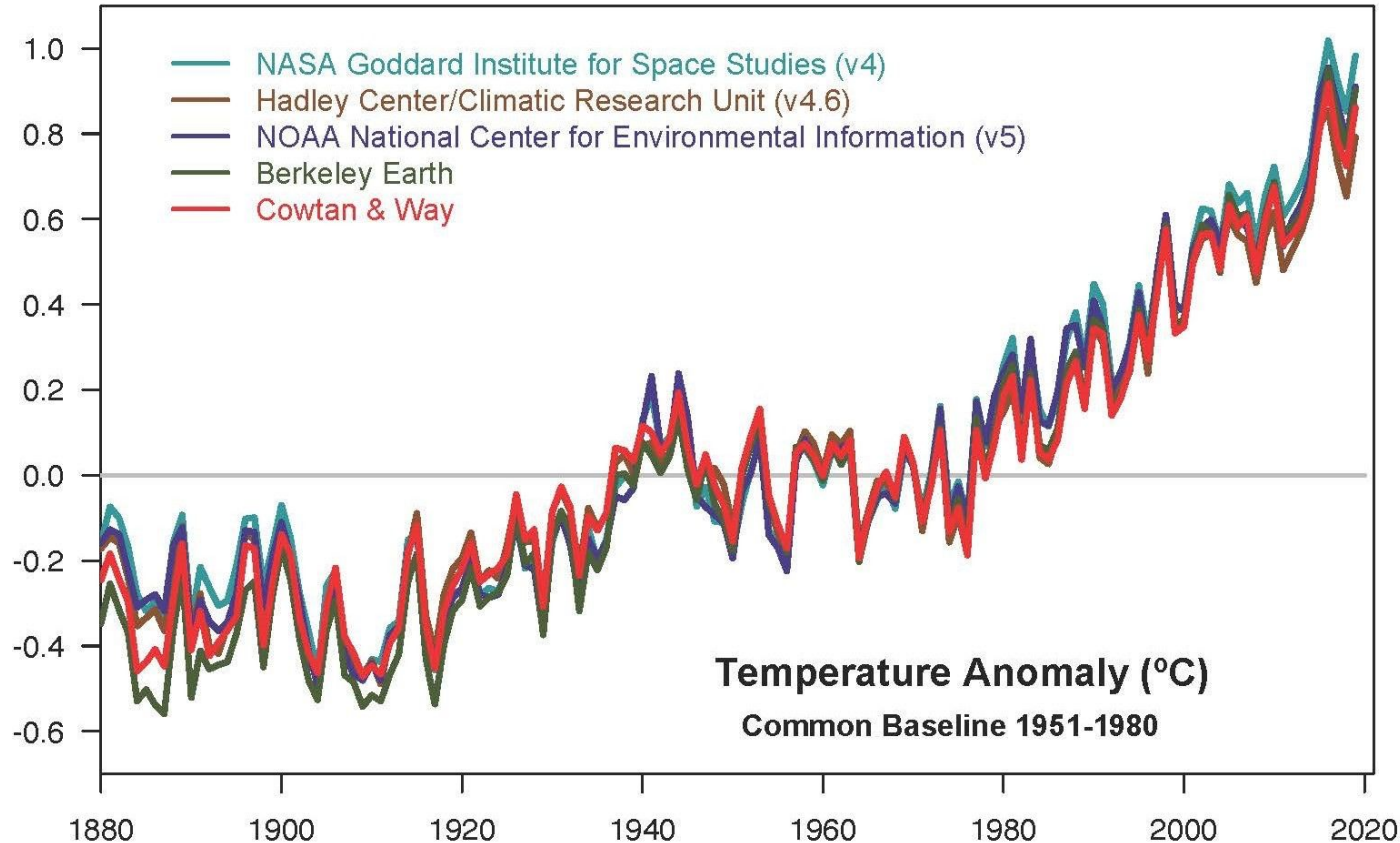
Why Bother ?

- Clear Globally
- Unclear Locally
- Time frame
- Change

Is my house on fire right now?

- Dataset courtesy of NOAA (National Oceanic and Atmospheric Administration) govt. of USA

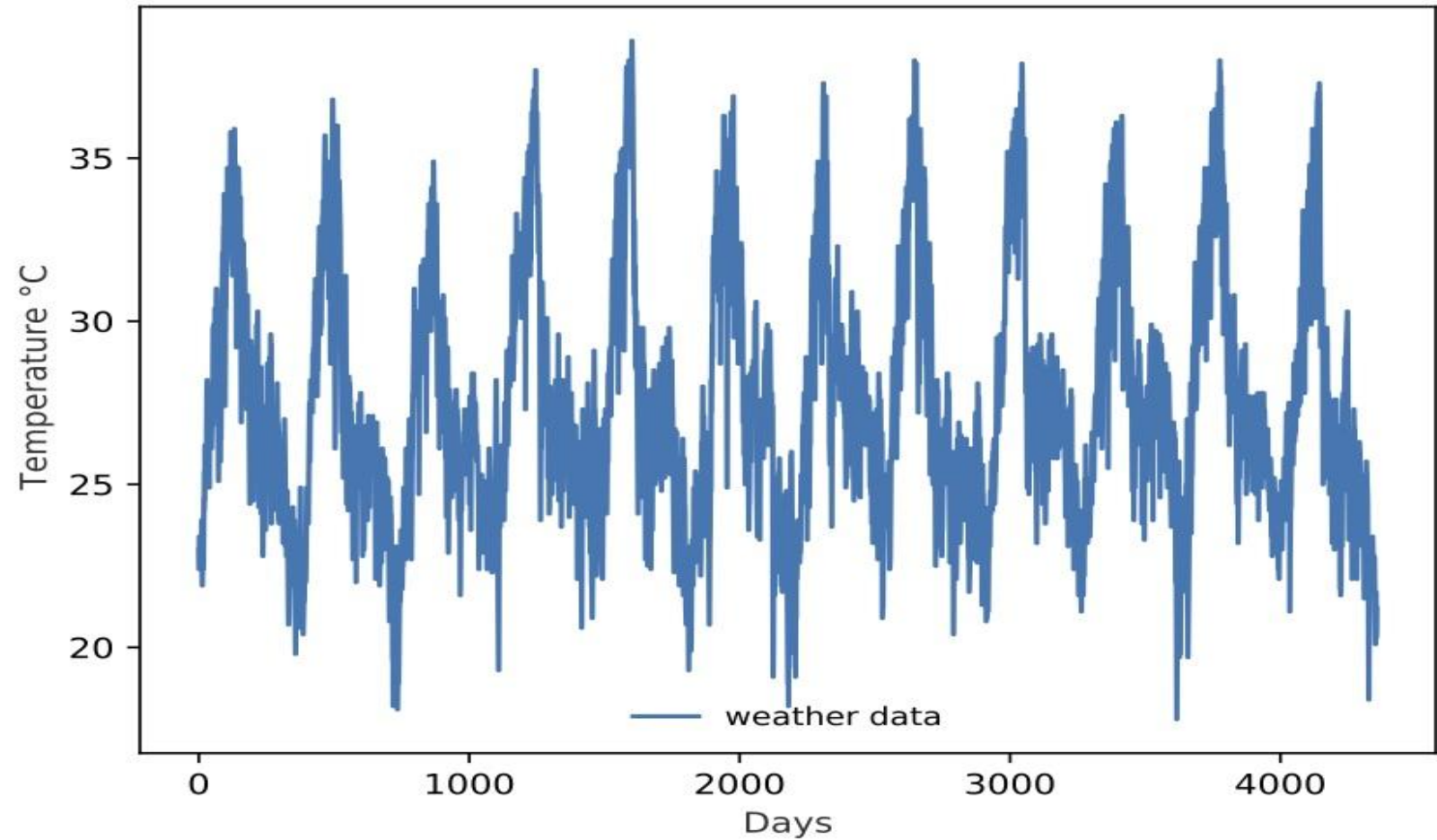
Visualizing Climate Change:



- Doesn't FEEL Significant ?
- Difficult to personally experience
- See the effects of this change
- Extreme Weather

Source: NASA

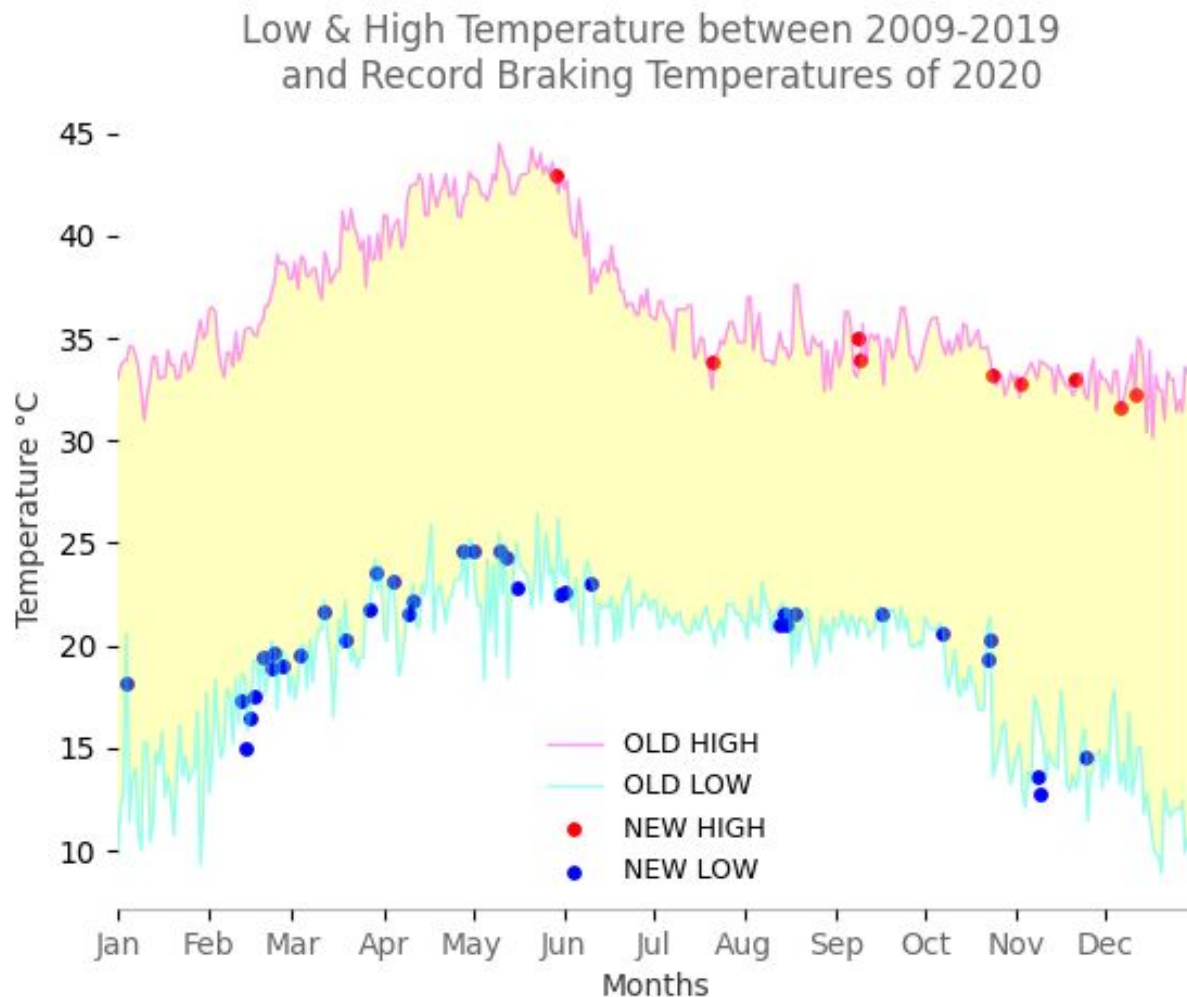
Last 10 years Data of Hyderabad



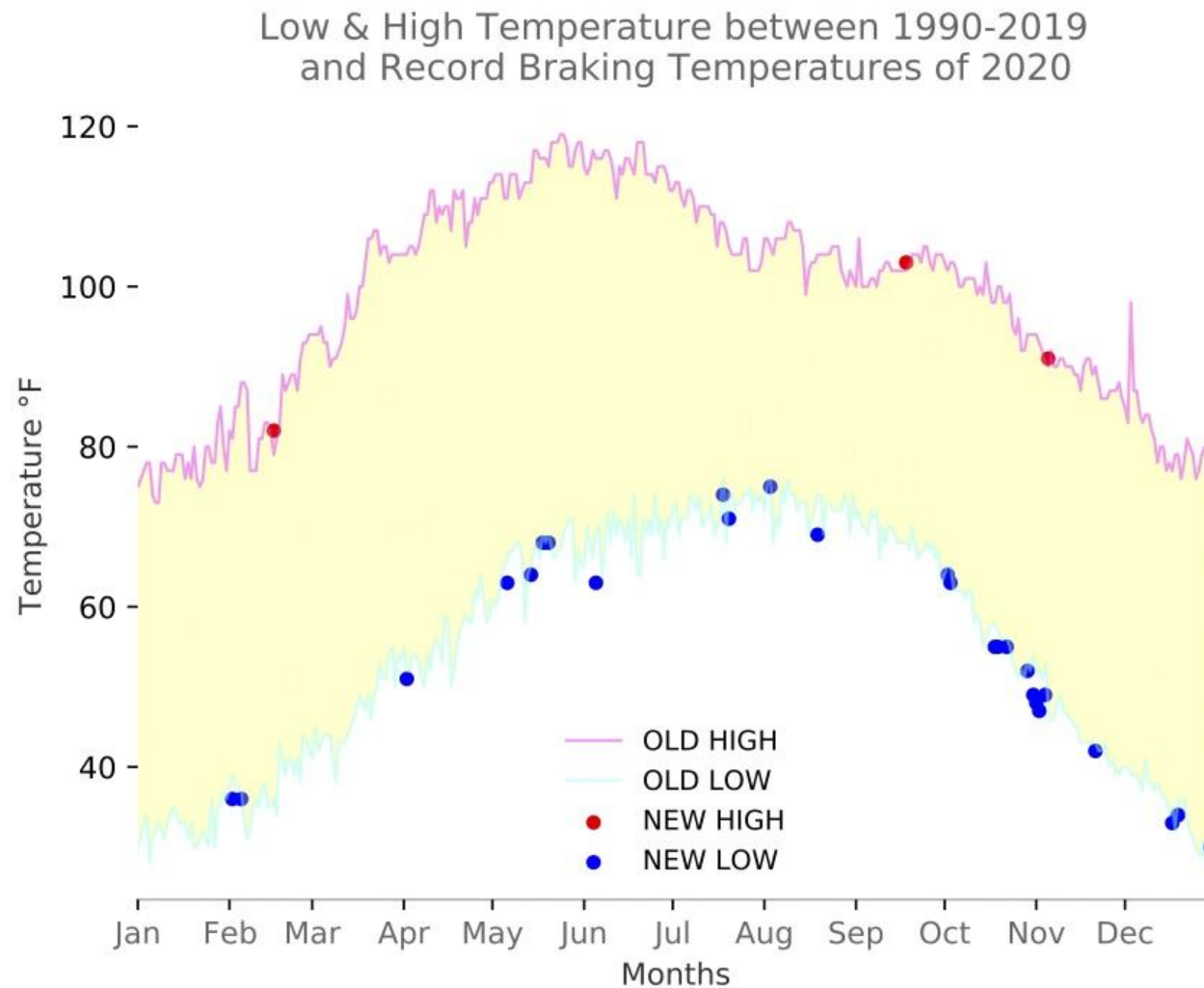
Data From a
weather Stations
near Hyderabad,
Telangana.

Is this Pan India?

Punjab



Data From 4
weather Stations
near Amritsar,
Punjab



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Thursday, 21 January 2021

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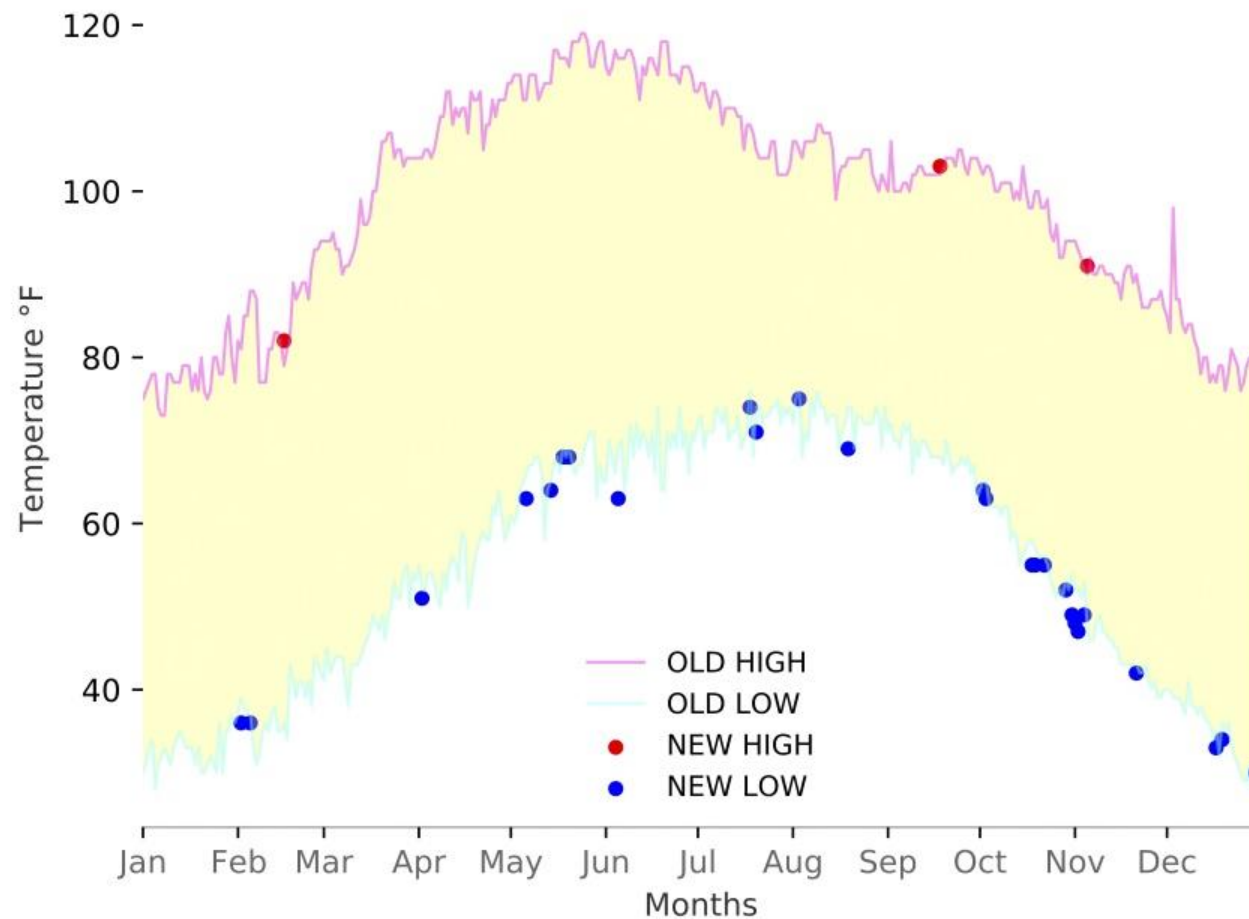
HARYANA

Cold wave grips Punjab and Haryana

The minimum in Hisar in Haryana dropped by six notches below normal, while Amritsar recorded 0.4 degree

Data From 4
weather Stations
near Amritsar,
Punjab

Low & High Temperature between 1990-2019 and Record Braking Temperatures of 2020



Powerful motivator

Cereals don't grow
well in sub-zero
climate

Modelling Climate using a Least Square Approximation

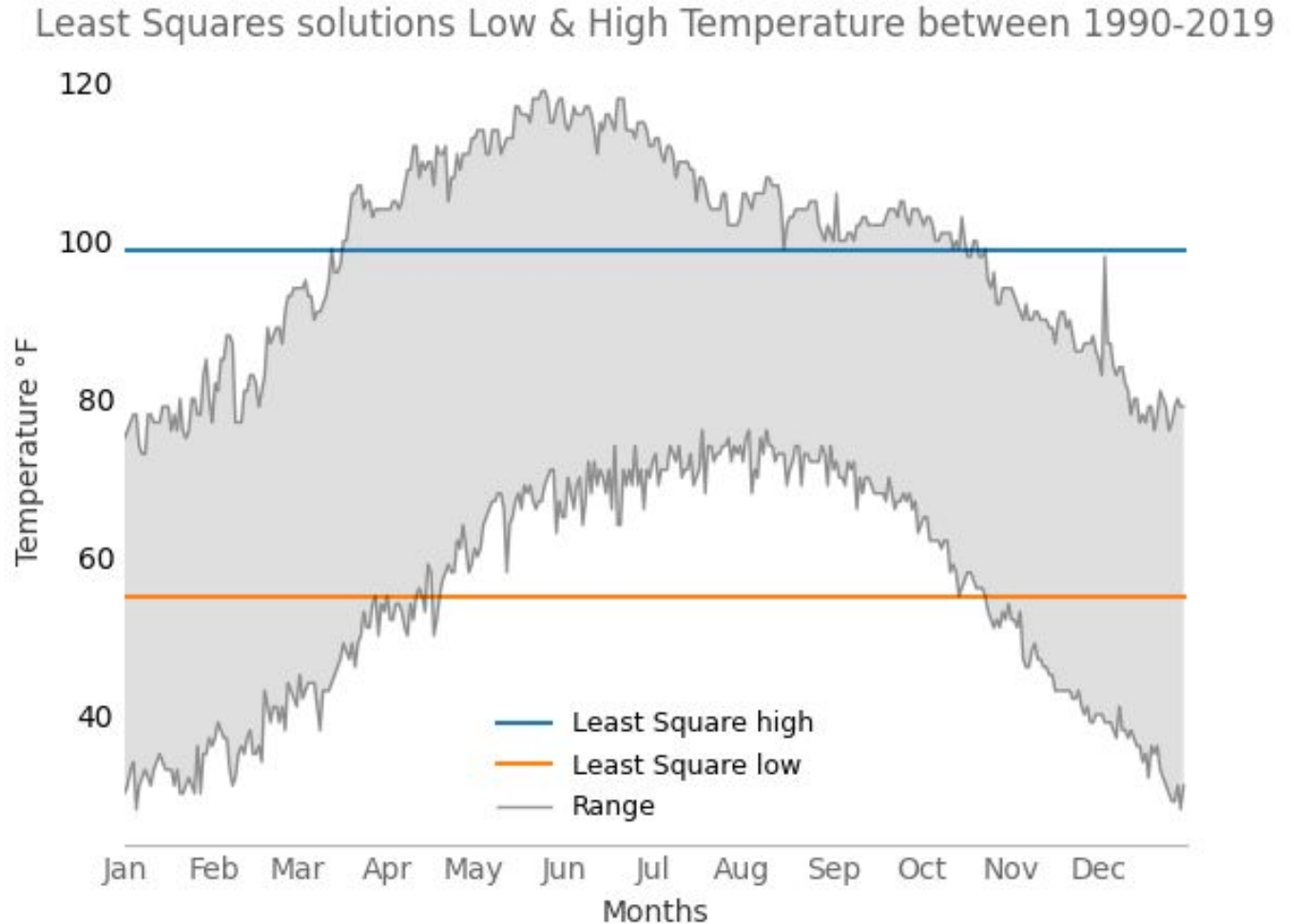
What is Least Square : The method of least square is a standard approach to approximate the solution of overdetermined systems by minimizing the sum of the squares of the residuals made in the results of every single equation.

$$A^T A x = A^T b$$

N=1

Norm Max=
242.6

Norm Min=
281.8

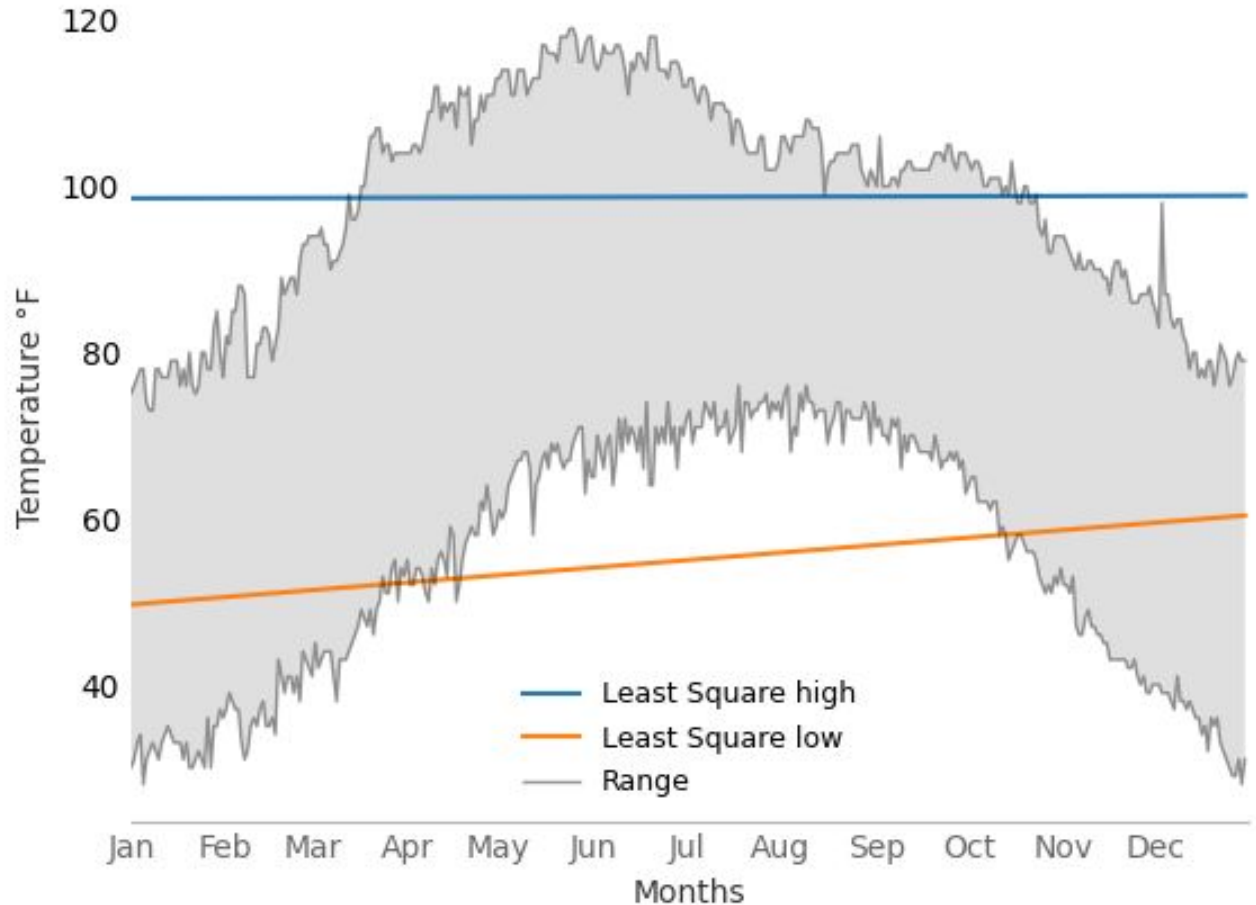


N=2

Norm Max=
242.6

Norm Min=
274.4

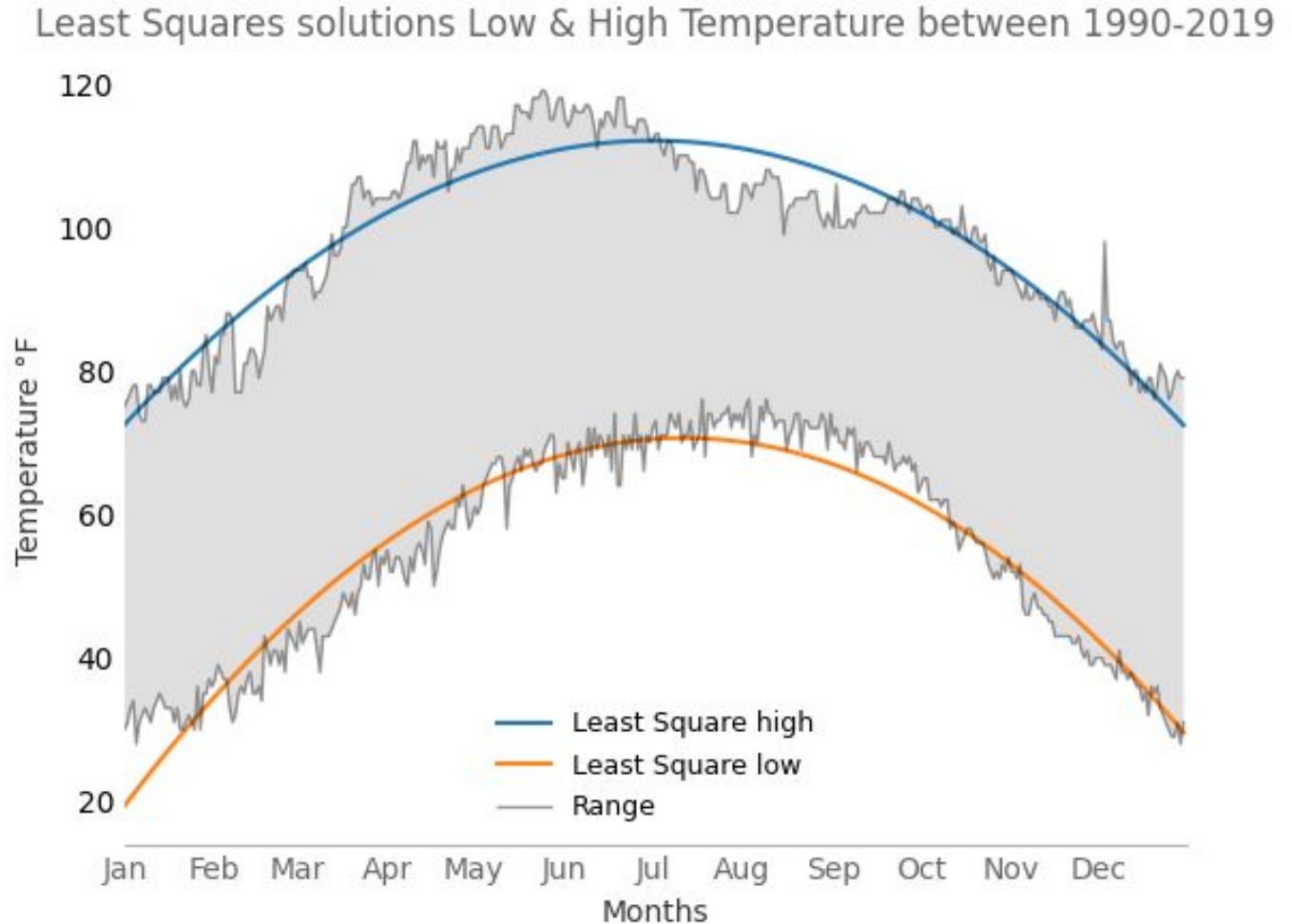
Least Squares solutions Low & High Temperature between 1990-2019



N=3

Norm Max=
82.92

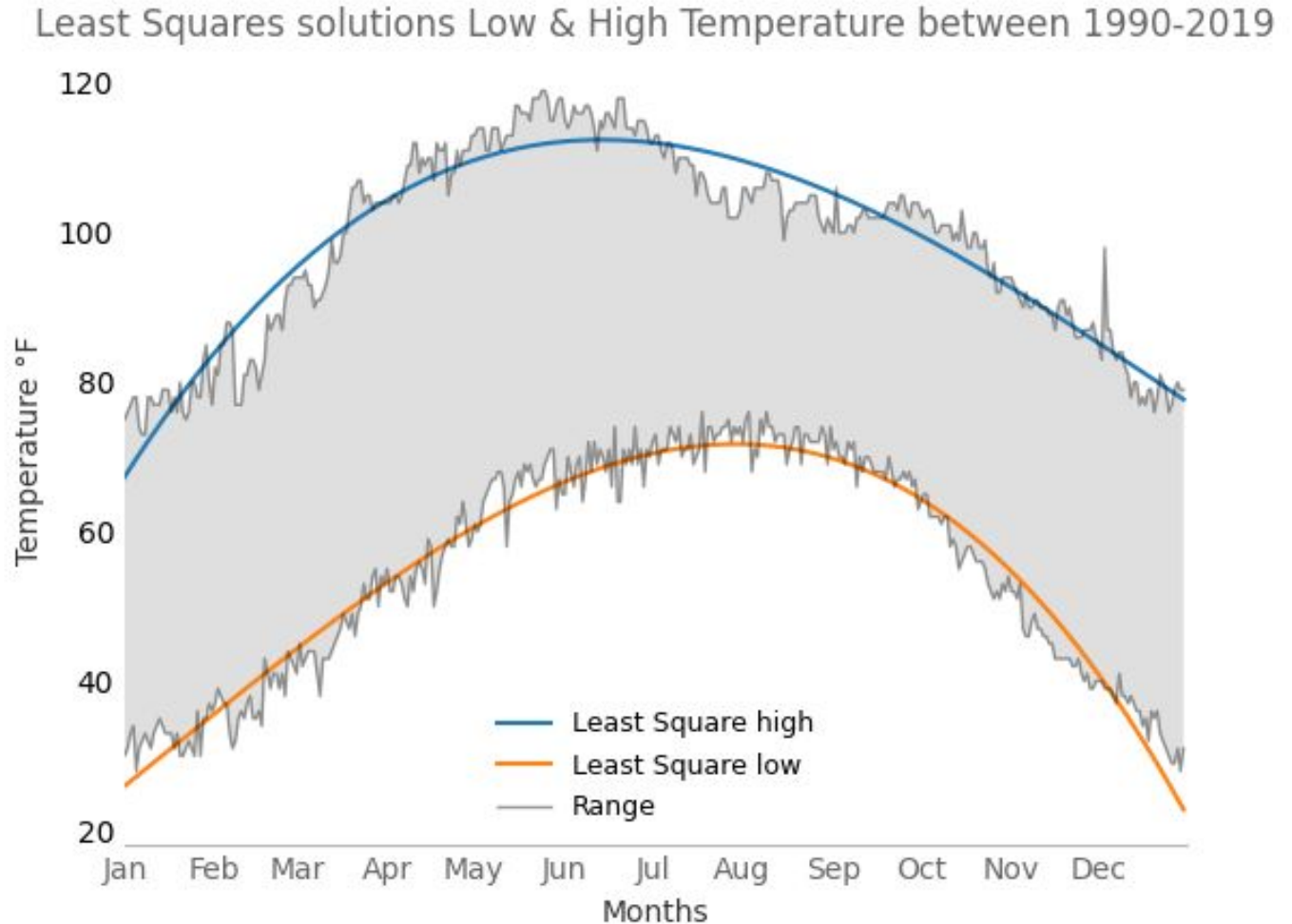
Norm Min= 76.5



N=4

Norm Max=
73.2

Norm Min= 58.1

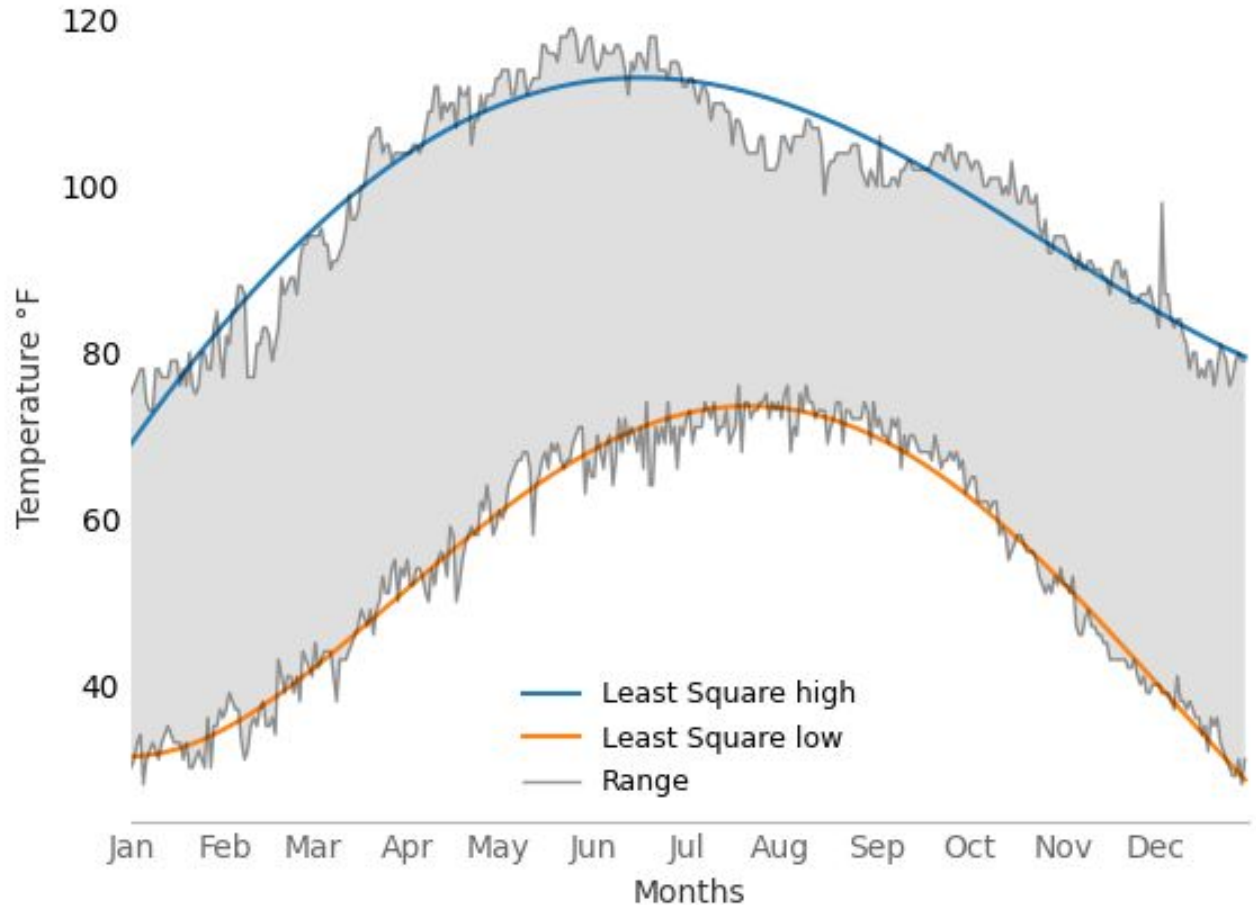


N=5

Norm Max=
72.2

Norm Min= 44.5

Least Squares solutions Low & High Temperature between 1990-2019

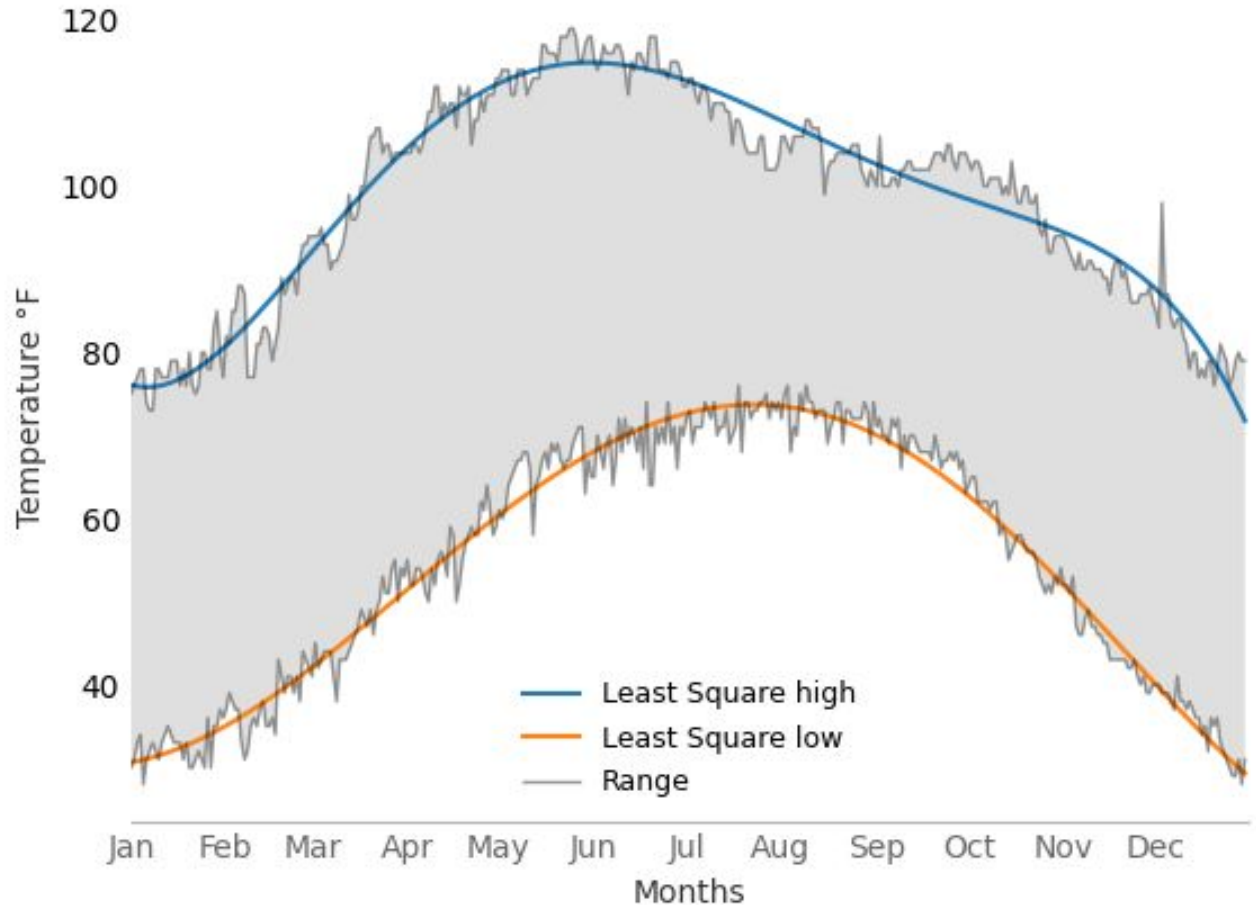


N=6

Norm Max=
55.6

Norm Min= 44.2

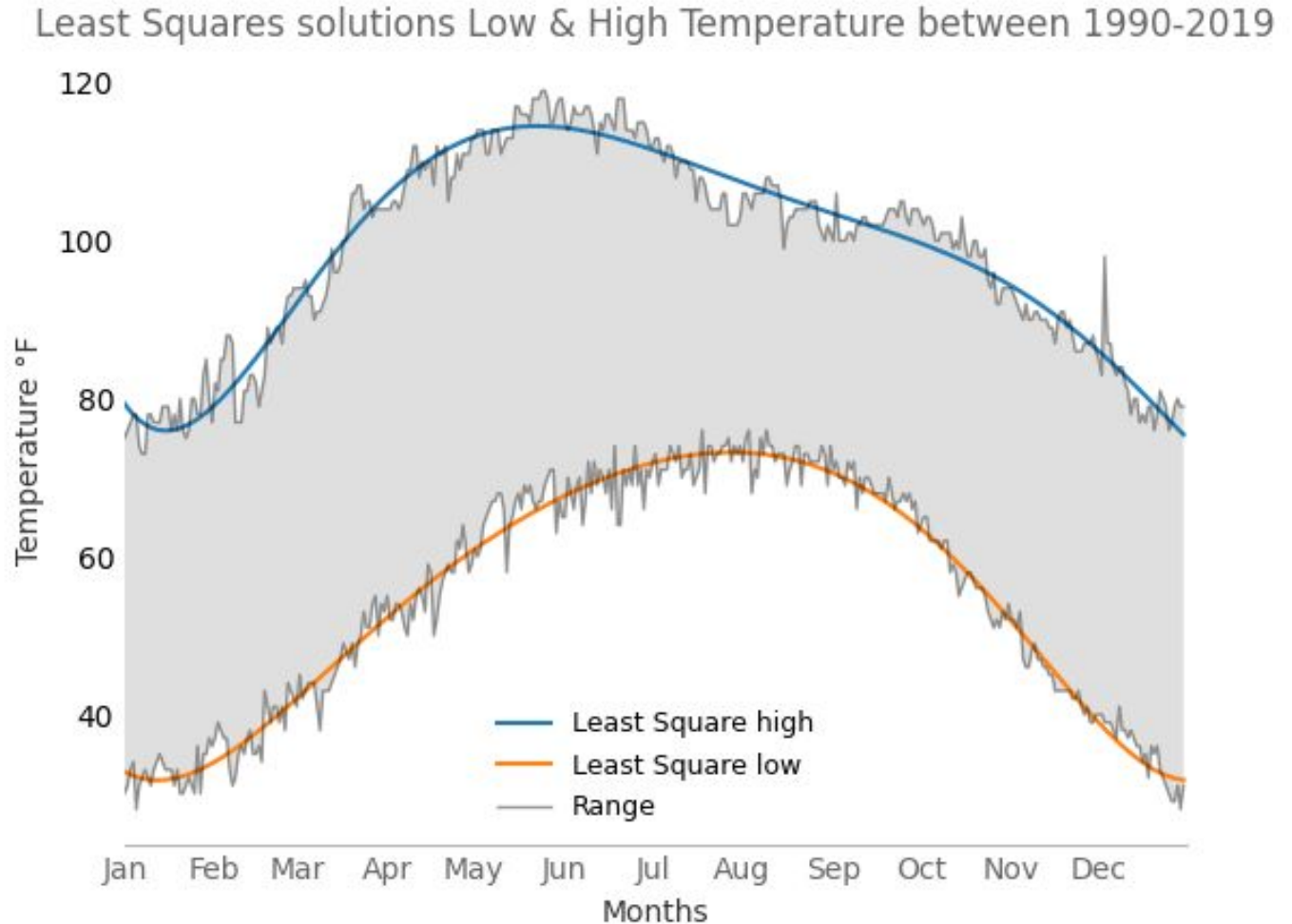
Least Squares solutions Low & High Temperature between 1990-2019



N=7

Norm Max=
51.6

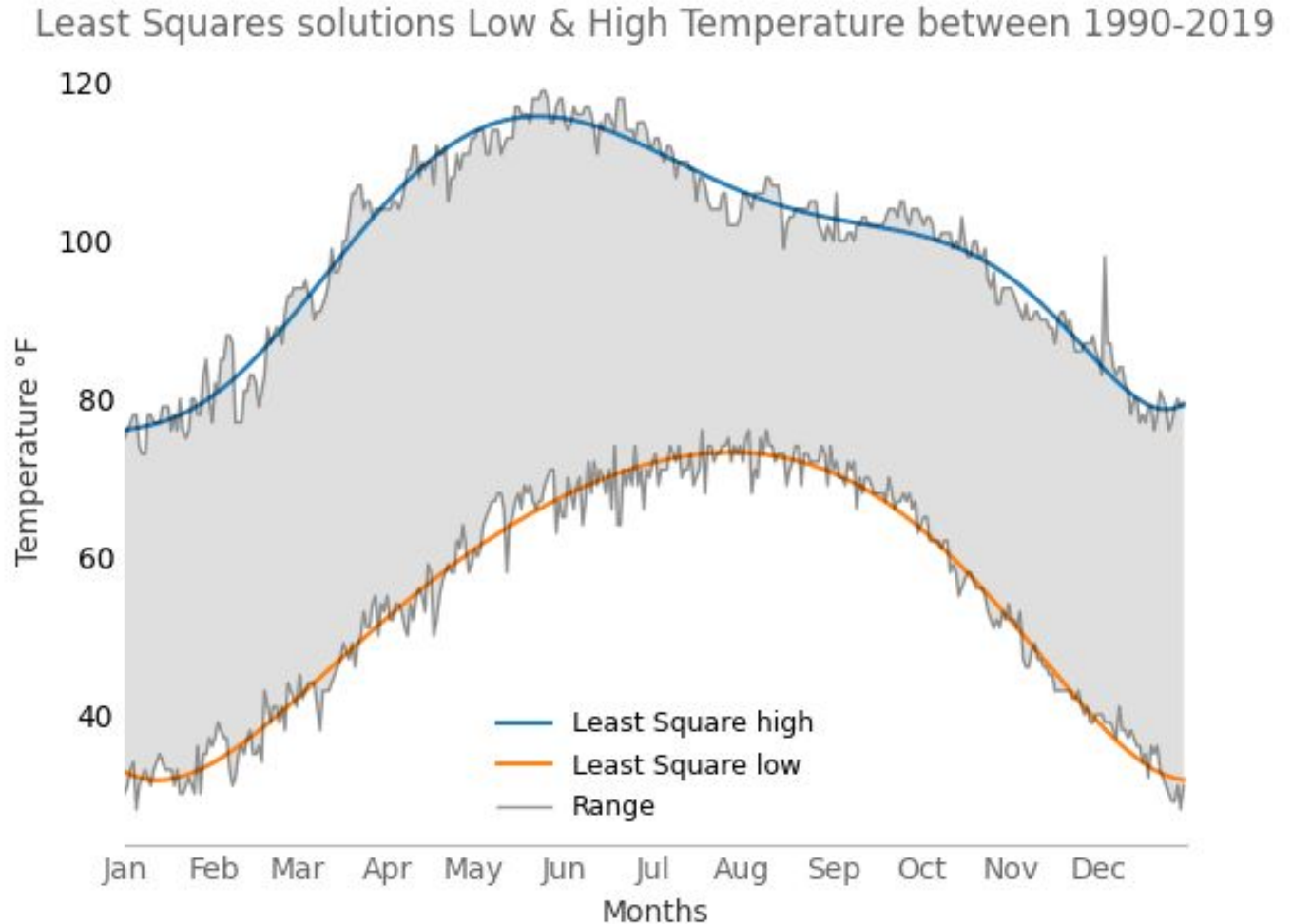
Norm Min= 42.2



N=8

Norm Max=
47.3

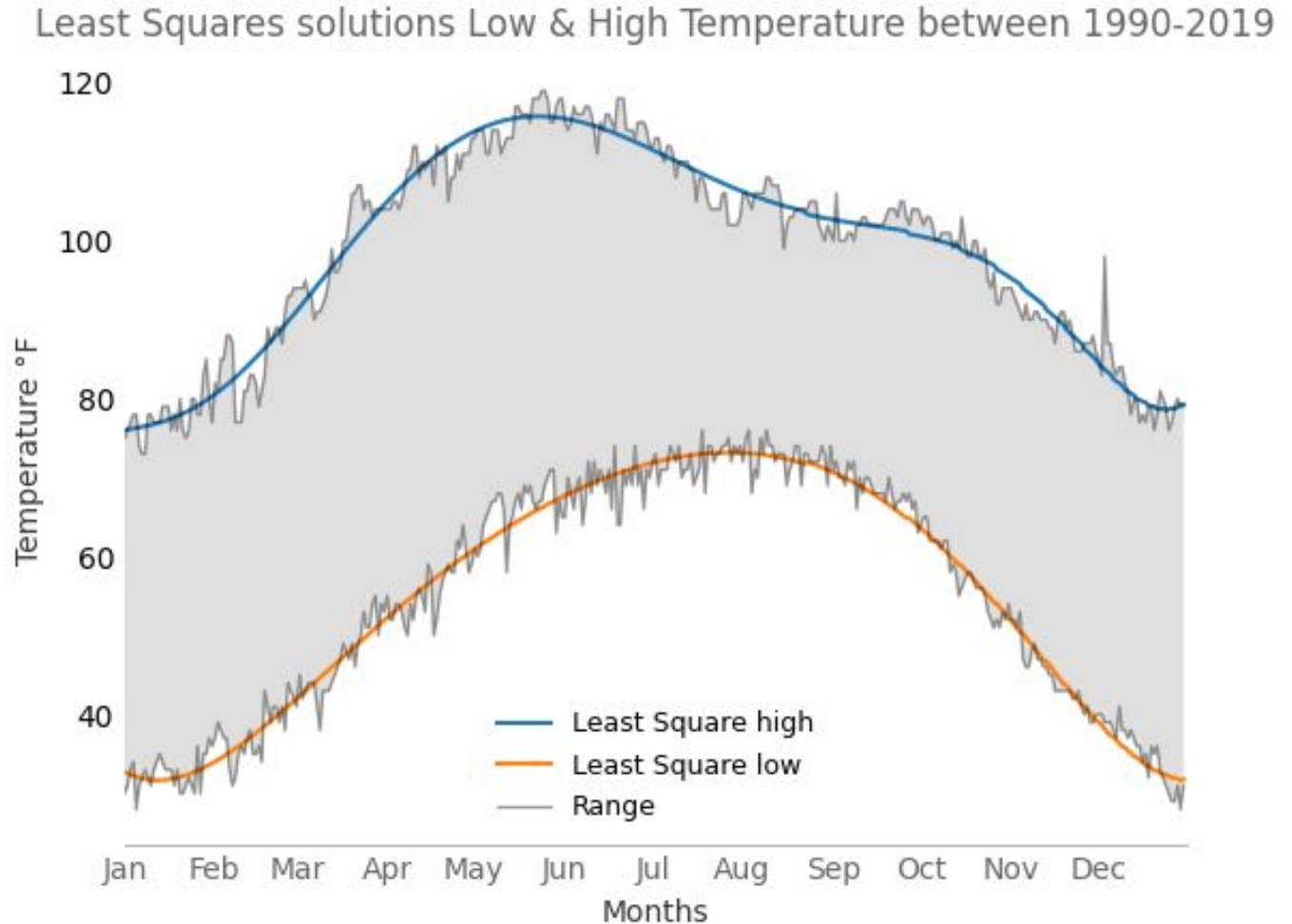
Norm Min= 42.2



N=9

Norm Max=
47.3

Norm Min= 42.2

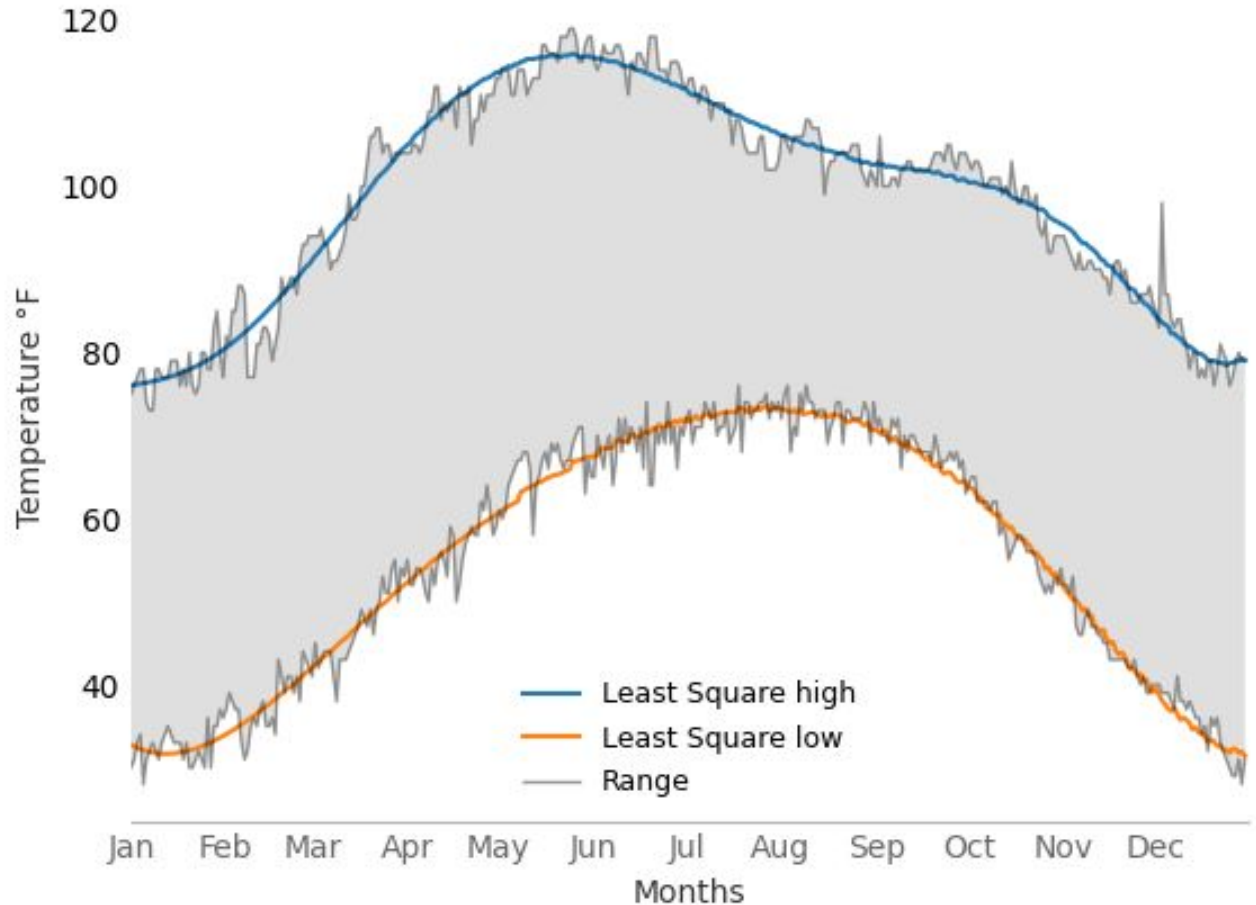


N=12

Norm Max=
47.3

Norm Min= 42

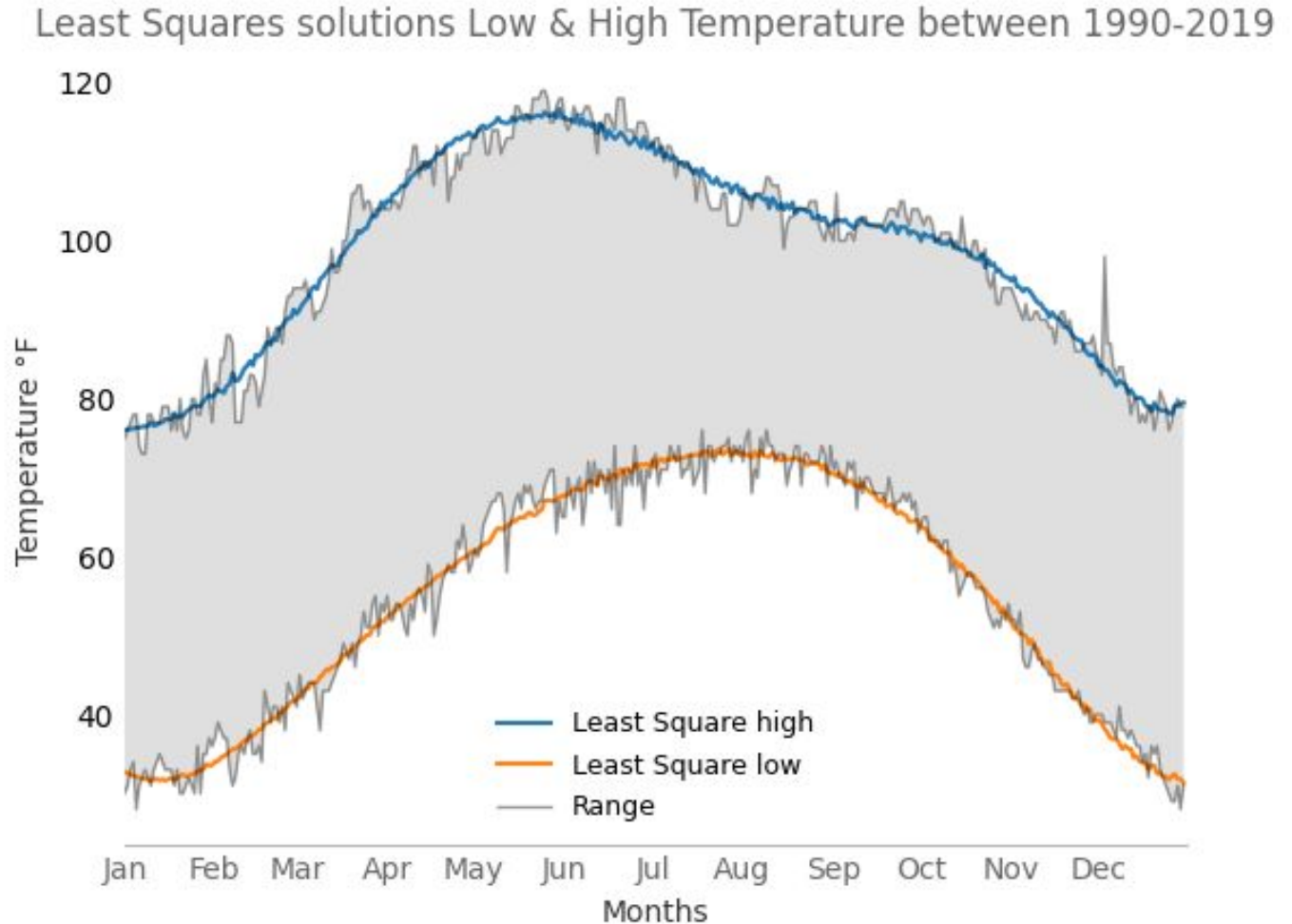
Least Squares solutions Low & High Temperature between 1990-2019



N=20

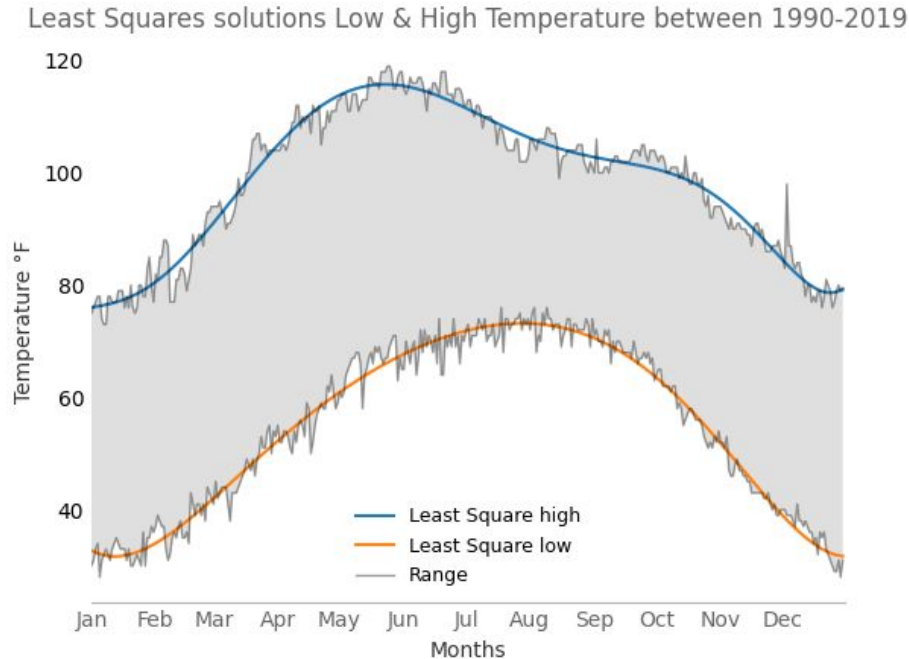
Norm Max=
46.8

Norm Min= 41.9

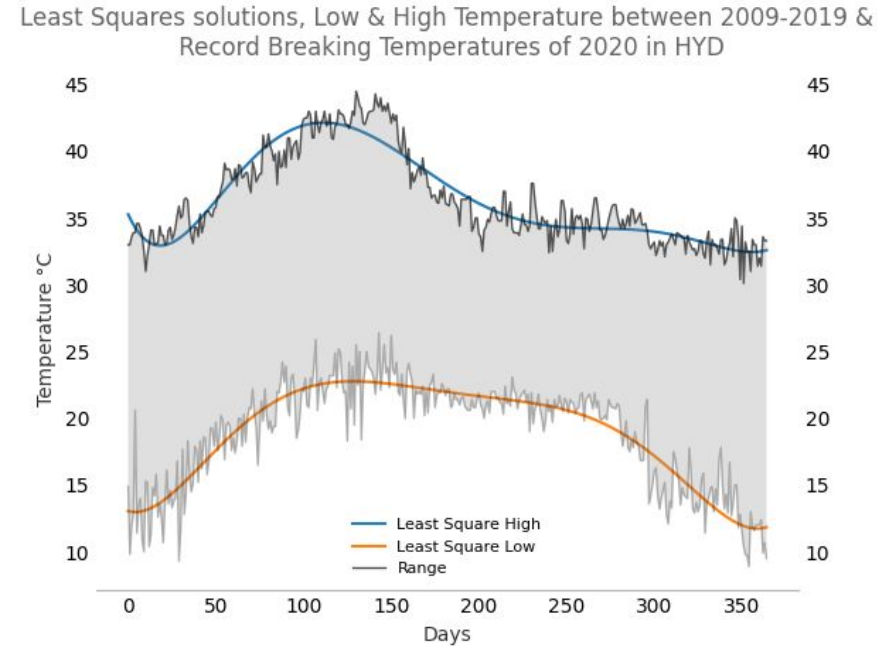


Optimal Climate Least Squares Model

Amritsar

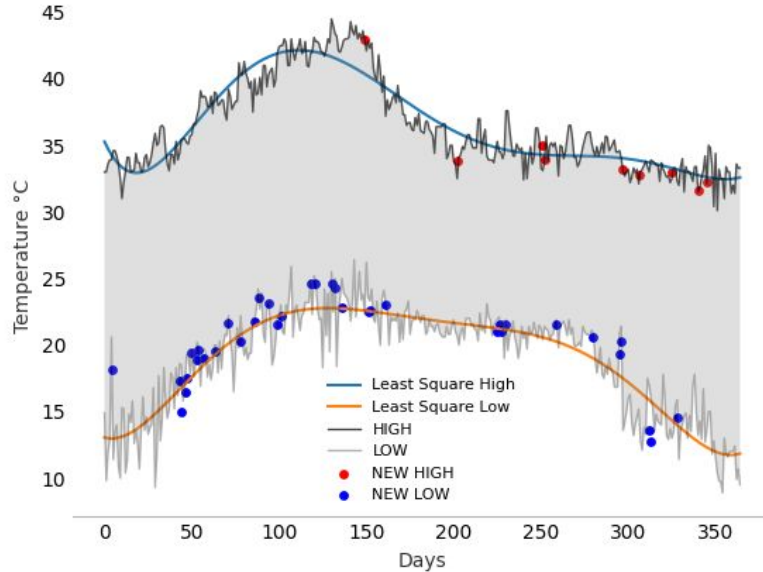


Hyderabad



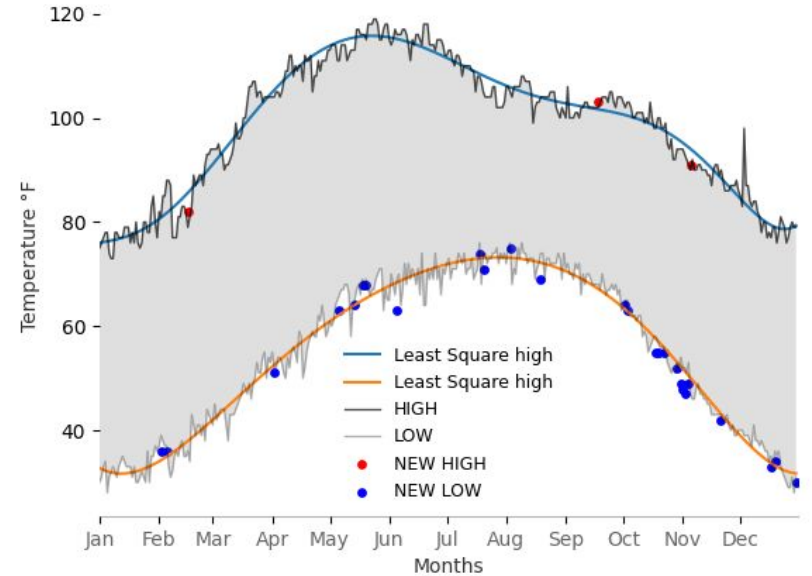
Final Visuals:

Least Squares solutions, Low & High Temperature between 2009-2019 & Record Breaking Temperatures of 2020 in HYD



Hyderabad

Least Squares solutions, Low & High Temperature between 1990-2019 & Record Breaking Temperatures of 2020



Amritsar

Thank You