# Bike Commuting Case Study

## Increasing Eric’s Bike Commute Frequency by Over 1000%

Logan Schmitt

# The problem: Eric bikes to work **less** each year

## Bike Commuting Pros

Bike commuting, in theory, has benefits:

- Physical health
- Mental health
- Environmental

## Bike Commuting Cons

Eric's commute, however, has challenges:

- Downhill in the mornings = **cold**
- Uphill in the evenings = **hot**
- Takes 2-3x longer than a car

## Problem statement

**How can we increase Eric's rate of bike commuting while addressing these challenges?**

# **Why** is Eric biking less?

# Challenges deep-dive

Challenge 1 → Challenge 2 → Challenge 3

**Weather**

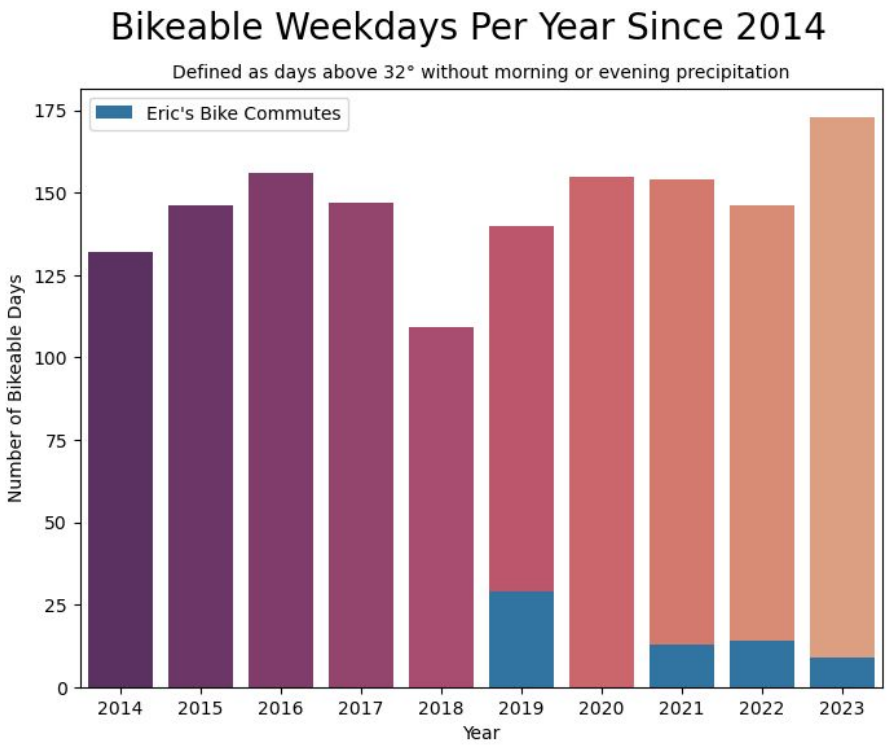
- How many days per year are suitable for bike commuting?
  - No precipitation
  - Temperatures above freezing

**Terrain**

- Eric's commute has large elevation changes
- Eric often rides into the wind in the mornings

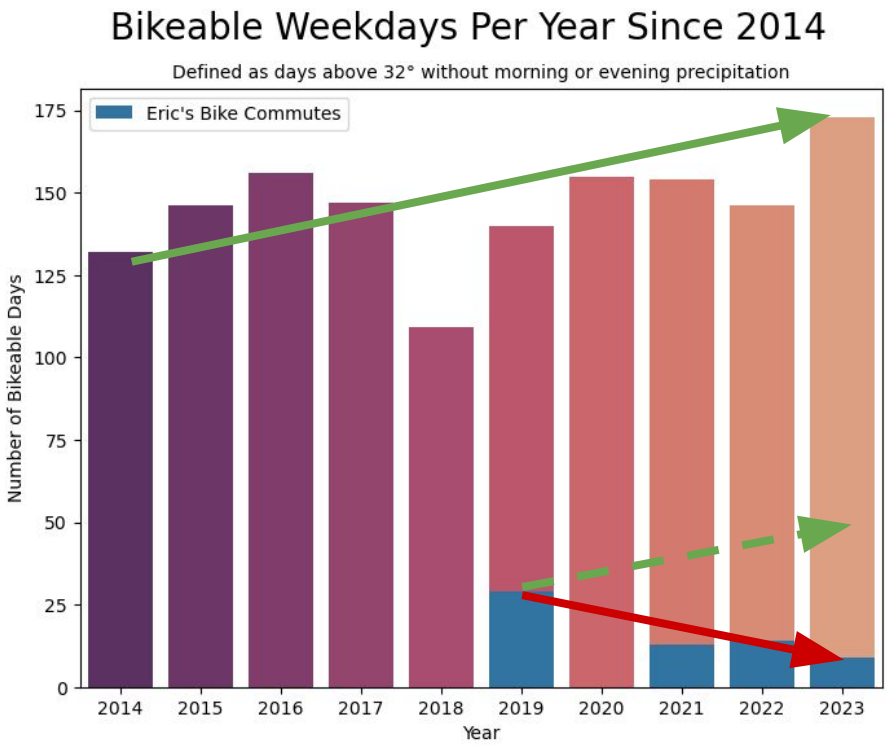
**Desire**

- Emotional: "I'm tired." "It takes too long." "I don't feel like riding today."
  - What can be done about this?




# Weather vs Ridership

- Eric’s commutership peaked in 2019
  - 20.7% of bikeable days
- Clear introduction of WFH in 2020
- Bike commutership down to 5.2% in 2023
  - Hybrid WFH?

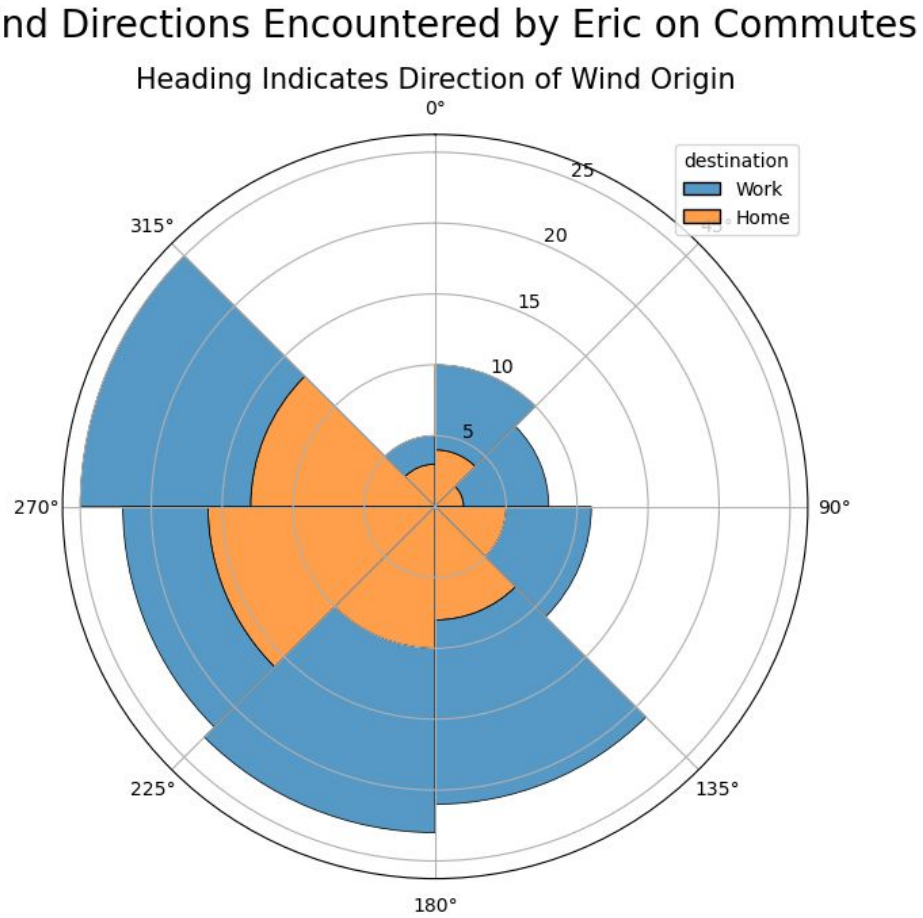



# Weather vs Ridership

- Expected positive trend in bikeable days
- How do we get Eric’s trendline to match?

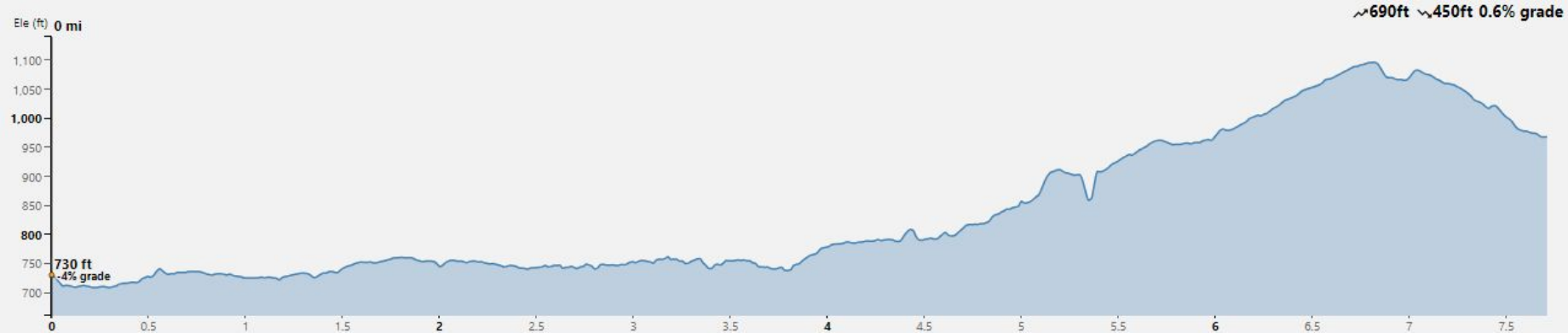
# Wind

- Eric’s commute direction is largely South and West in the mornings
- Eric tends to encounter headwinds on his morning rides



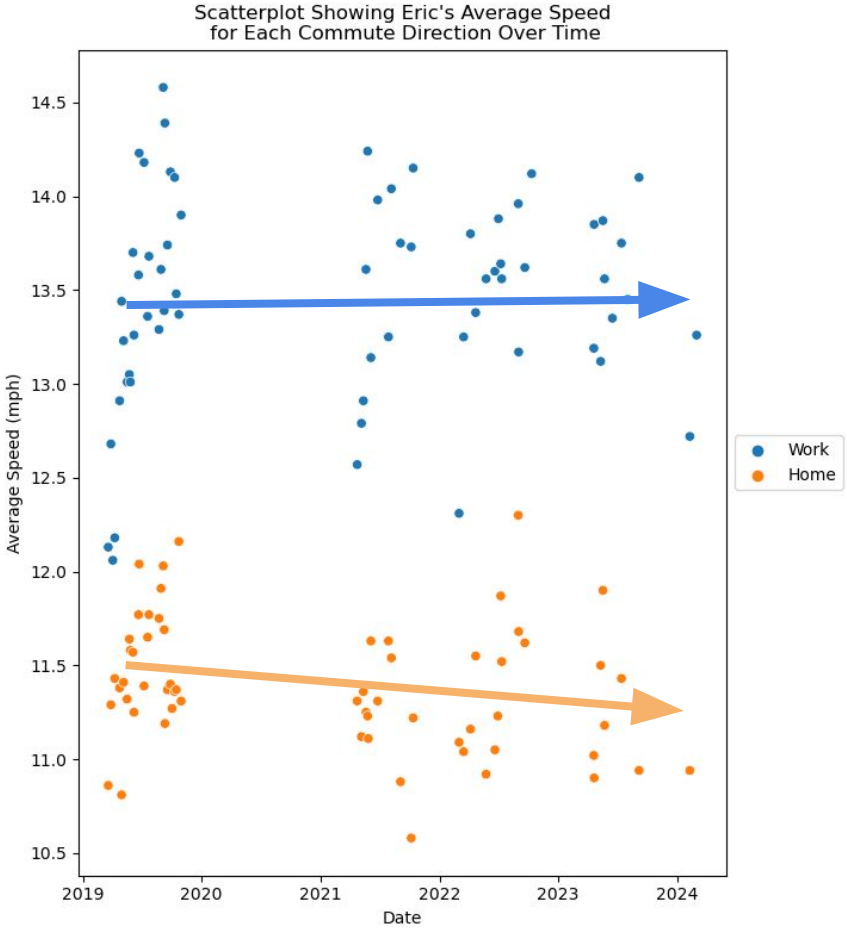
# Terrain

- Eric commutes from the East End to downtown Pittsburgh
- Eric’s morning commute is largely downhill
- Eric’s evening commute features over 650 feet of climbing



# What Does This Mean?

- Time & Effort Mismatch
  - Morning commute = **downhill**, into the **wind**, during the **coldest** part of the day
  - Evening commute = **uphill** during the **hottest** part of the day
  - Dress for the cold mornings → Overheat in the warm evenings
  - Bring layers for the cold mornings → Extra baggage in the warm evenings
- Bike commuting begins to feel like a hassle → Loss of desire




# Speed Over Time

- Observed stable trend in Eric’s average morning speed
- Observed negative year-over-year trend in Eric’s average evening speed
- 2024 averages are down in both directions
- Eric is spending less time at home and more time getting there

With all this in mind…

# Why not drive?

- Mean cost of car ownership rose to $0.72 per mile in 2022 [1]
  - Eric's 14-mile round-trip commute costs him over **$10 per day**
- Parking
- Driving a car 14 miles emits between 7.75 and 10.5 lbs of $CO_2$ daily [2]

[1] https://data.bts.gov/stories/s/Transportation-Economic-Trends-Transportation-Spen/bzt6-t8cd/#:~:text=2022%20Year%2Din%2DReview,2020%20%E2%80%93%20at%20%240.44%20per%20mile.

[2] https://climate.mit.edu/ask-mit/are-electric-vehicles-definitely-better-climate-gas-powered-cars

# Solution

Kona Rove HD

# How does this e-bike solve all of Eric’s challenges?

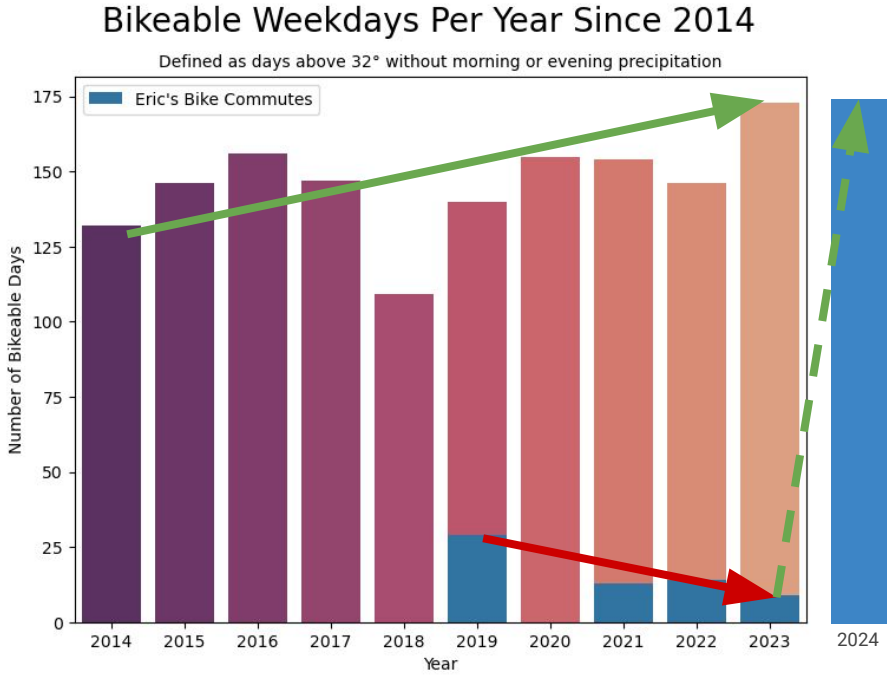
# Effort Modulation: Work as hard as you want

- Want to bundle up in the morning? Pedal assist can keep you from working up a sweat on the way to the office.
- Carrying lots of layers home? Use a frame pack to hold the extra baggage. The bike won’t even notice the extra weight.
- Want a workout? Reduce the assistance or turn the motor off entirely
- Want a break from the 700’ climb? No problem for the 418 Wh battery and 60 Nm torque hub drive.

# Is it worth the cost?

# Benefits

- At $2,199, the bike will pay for itself in just 218 days of commuting
    - Summer 2025 based on bikeable weather projections
- Save over 1 ton of $CO_2$ emissions in that time
- Save nearly 100 hours compared to bike commuting over the same span
    - At an average commuting speed of 20 mph
- Spend 60+ excess hours outdoors yearly compared to 2023
- Parts compatibility with current Kona bike




# Impacts

- Potential for 2000% bike commutership increase
- Renewed excitement for bike commuting
- Invaluable time savings
- Mental, physical, environmental health