

Assessing generative artificial intelligence tools for analyzing bird banding data



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**Science has a
stats problem**

Statistics in medical research: Common

miCommon Mistakes in Statistical and Methodological Practices
Corof Sport Management Research

AssS How to get wrong results from good experimental data: a
in survey of incorrect applications of regression

Towards better research: A discussion of
some common mistakes in statistical
analyses

PhD Students and the Most Frequent Mistakes During Data
Interpretation by Statistical Analysis Software

AI to the rescue?

Generative AI is democratizing skills...

- GenAI is leveling the playing field and lowering the bar for entry in so many areas:
 - Writing
 - Coding
 - Graphic design
 - Data analysis
 - Data visualization
 - etc.



Image courtesy: [pexels.com/photo/persons-hand-with-silver-ring-5716037/](https://www.pexels.com/photo/persons-hand-with-silver-ring-5716037/)

...but is it right?

- GenAI training datasets are heavily based on existing literature and user feedback
 - Garbage in = Garbage out
- Hallucinations (i.e., incorrect information presented as factual) are still quite common
- Ethical questions should also be considered

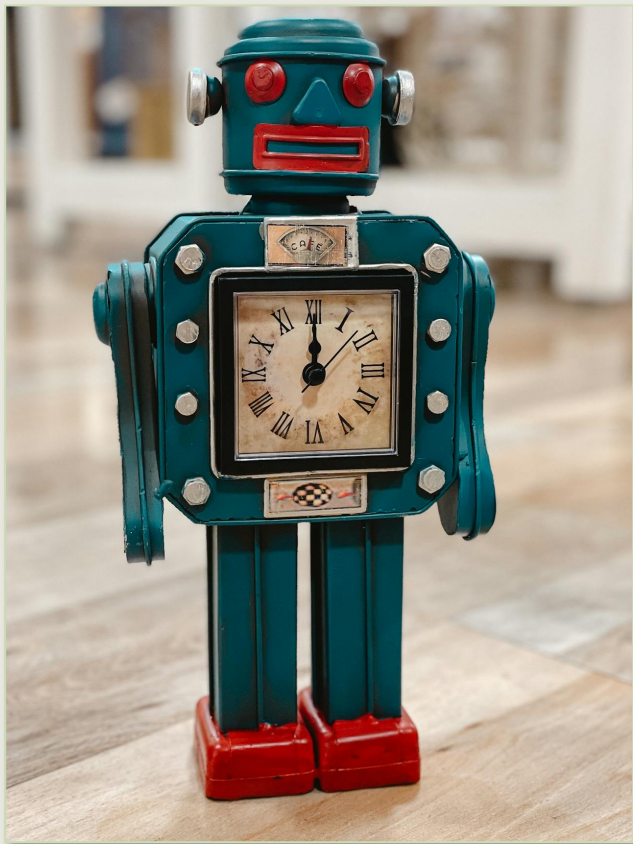


Image courtesy: pexels.com/photo/blue-and-red-robot-clock-9026734/

Guiding Question

Is genAI advanced enough to perform accurate analyses with real-world datasets?

The Dataset

- Excel file
- One year of data per sheet: 2004 through spring of 2022
- Did not clean or manipulate
- Contains detailed banding information collected by AREI at Hueston Woods Banding Station in Oxford, OH
 - General info (species, age, sex, etc.)
 - Morphometrics (wing length, tail length, skull size, etc.)
 - Capture info (net location, date, time, etc.)



Image courtesy: Kyra Harvey
<https://www.usgs.gov/media/images/banding-american-woodcock>

ChatGPT



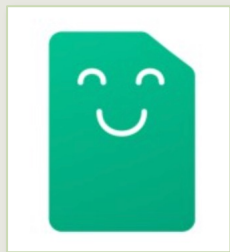
Claude



NotebookLM



FormulaBot



Rows AI



Quadratic



Exploring AI Data Analysis: Methods

- Uploaded longitudinal bird banding dataset to six different generative AI models
 - Three dedicated to data analysis (FormulaBot, Rows AI, Quadratic)
 - Three generalist models (ChatGPT, Claude, NotebookLM)
- Interrogated tools about dataset
- "Conversations" reported here occurred in March 2026, except otherwise noted

Relevant Data

Age (pre-WRP)

Indeterminable	0
After Hatching Year	1
Hatching Year	2
Not Used	3
Local	4
Second Year	5
After Second Year	6
Third Year	7
After Third Year	8
Not Attempted	9

Wing Chord



Sex



Weight



Image courtesy: Dave Russell

GenAI Data Analysis Overview

The Good



[Most] can do basic data manipulation and analyses.

The Bad



Accuracy in analyses is highly variable.

Often has incorrect underlying assumptions.



Query 1

Tell me about this dataset.

Data Analysis: The Good

Query 1: Tell me about this dataset.

ChatGPT



1. Overall Structure

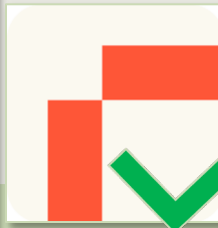
- **Type of data:** Bird banding records (likely from a bird banding station project).
- **Time span:** 2004–2022
- **Sheets:** 20 total
 - One sheet per year (2004–2022)
 - One additional sheet: "**BlueJay**" (likely a focused dataset for that species).

This is a **bird banding dataset** — a long-term wildlife monitoring record spanning nearly two decades (2004–2022). Here's a summary:

What this dataset is

This spreadsheet is a bird banding / capture log split into separate tables by year (pages named **2004–2022**, plus **BlueJay**). You're currently viewing the **2004** table.

Rows AI



Claude



Data Analysis: The Good

Query 1: Tell me about this dataset.



This dataset contains detailed **bird banding records** spanning a 19-year period from **2004 to 2022** ¹ ². It consists of individual entries for various bird species captured, measured, and banded at specific study locations ¹

FormulaBot



This is a **bird banding dataset** containing records from **2004** (and not data currently shows only 2004 records). Here's what you have:

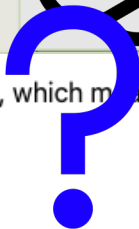
This is a **bird banding dataset** spanning **2004–2022**, with each year on its own sheet plus a dedicated **BlueJay** sheet. Here's an overview:

Quadratic



Query 2

In 2016, which species was captured the least frequently?



Data Analysis: The Good Iffy

Query 2: In 2016, which species was captured the least frequently? Mar 2026

May 2024

Feb 2025

Oct 2025



For the y
frequentl

In the 2016 c
frequently c

- WAVI (V)
- WIFL (V)
- DOWO
- LOWA (
- PIWO (P
- BTBW (
- NRWS (
- RBNU (
- EWCS (
- EAWP (

In the 2016 sheet, several species were captured **only once**, which means they were the least frequently captured species that year. 🇮🇹🐦

Species captured 1 time in 2016

- ~~EAWP – Eastern Wood-Pewee~~
- **EWCS – Eastern Wood-Pewee? (likely a code variant used in the dataset)**
- BTBW – Black-throated Blue Warbler
- BRGR – Brown Creeper
- BTNW – Black-throated Green Warbler
- DOWO – Downy Woodpecker
- LOWA – Louisiana Waterthrush
- RBNU – Red-breasted Nuthatch
- NRWS – Northern Rough-winged Swallow
- PIWO – Pileated Woodpecker
- WAVI – Warbling Vireo
- TRFL – Trail's Flycatcher
- SUTA – Summer Tanager
- WIFL – Willow Flycatcher

In 2016, the following species were captured

- WAVI (Warbling Vireo)
- WIFL (Willow Flycatcher)
- DOWO (Downy Woodpecker)
- LOWA (Louisiana Waterthrush)
- PIWO (Pileated Woodpecker)
- BTNW (Black-throated Green Warbler)
- **TRFL (Tropical Flycatcher)**
- SUTA (Summer Tanager)

Data Analysis: The Good Iffy

Query 2: In 2016, which species was captured the least frequently?

Quadratic



In 2016, **14 species** were tied for least frequently captured, each with only **1 capture**:

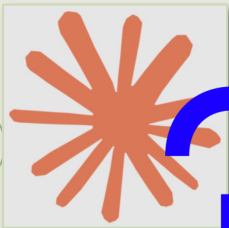
Species Code	Common Name
BRCR	Brown Creeper
BTBW	Black-throated Blue Warbler
BTNW	Black-throated Green Warbler
DOWO	Downy Woodpecker
EAWP	Eastern Wood Pewee
EWCS	Eastern Screech-Owl
LOWA	Louisiana Waterthrush
NRWS	Northern Rough-winged Swallow
PIWO	Pileated Woodpecker
RBNU	Red-breasted Nuthatch
SUTA	Summer Tanager
TRFL	Trail's Flycatcher
WAVI	Warbling Vireo
WIFL	Willow Flycatcher

Data Analysis

Query 2: In 2016, which sp

Code	Species
BRCR	Brown Creeper
BTBW	Black-throated Blue Warbler
BTNW	Black-throated Green Warbler
DOWO	Downy Woodpecker
EAWP	Eastern Wood-Pewee
EWCS	(Empidonax/Willow/Cedar — likely a rare flycatcher)
LOWA	Louisiana Waterthrush
NRWS	Nashville Warbler
PIWO	Pileated Woodpecker
RBNU	Red-breasted Nuthatch
SUTA	Swainson's Thrush (alt code)
TRFL	Traill's Flycatcher
WAVI	White-eyed Vireo
WIFL	Willow Flycatcher

Claude



Data Analysis: The ~~Good~~ Iffy

Query 2: In 2016, which species was captured the least frequently?

Answer

For the year 2016, there were **5 species tied for least frequently captured**, each with only **1 capture**:

1. **WAVI** (Wood Auk Vireo)
2. **TRFL** (Tropical Flycatcher)
3. **SUTA** (Sutherlandia)
4. **BTBW** (Black-throated Blue Warbler)
5. **BRCR** (Brown Creeper)

If you need to pick just one, **WAVI** is the first alphabetically. The 2016 dataset contained **619 total records** across **70 different species**, with the most frequently captured species being GRCA and NOCA (each with 58 captures).

FormulaBot



Data Analysis: The Good Iffy

Query 2: In 2016, which species was captured the least frequently?

Rows AI



I added a table “**2016 Least-captured species**” listing the species (and capture count) that were captured the least frequently in **2016** (including ties).

In **2016**, the least-frequently captured species are **tied at 1 capture each**:
BRCR, BTBW, BTNW, DOWO, EAWP, EWCS,
LOWA, NRWS, PIWO, RBNU, SUTA, TRFL, WAVI,
WIFL.

2016 Le... Options

All species tied for the minimum number of captures in 2016 (excluding blank species).

	A ▾	B ▾	+
1	Species	Captures	
2	BRCR	1	
3	BTBW	1	
4	BTNW	1	
5	DOWO	1	
6	EAWP	1	
7	EWCS	1	
8	LOWA	1	
9	NRWS	1	
10	PIWO	1	
11	RBNU	1	
12	SUTA	1	
13	TRFL	1	
14	WAVI	1	
15	WIFL	1	
+	New row		

Data Analysis: The Good Life

Query 2: In 2016, which species

NotebookLM



In the year 2016, there were several species tied for the least frequent capture, each documented with only **one individual record** in the source material 1 ... :

- **Brown Creeper (BRCR)**: Band number 2550-41811 9 .
- **Black-throated Blue Warbler (BTBW)**: Band number 2750-76935 10 .
- **Black-throated Green Warbler (BTNW)**: Band number 2550-41800 10 .
- **Downy Woodpecker (DOWO)**: Band number 2331-91649 13 .
- **Eastern Wood-Pewee (EAWP)**: Band number 2750-76798 14 .
- **White-crowned Sparrow (EWCS)**: Band number 2711-95972 14 .
- **Louisiana Waterthrush (LOWA)**: Band number 2511-53657 24 .
- **Northern Rough-winged Swallow (NRWS)**: Band number 2750-76790 37 .
- **Pileated Woodpecker (PIWO)**: Band number 0994-00123 40 .
- **Red-breasted Nuthatch (RBNU)**: Band number 2750-76974 41 .
- **Summer Tanager (SUTA)**: Band number 2331-91644 45 .
- **Traill's Flycatcher (TRFL)**: Band number 2750-76794 48 .
- **Warbling Vireo (WAVI)**: Band number 2750-76902 48 .
- **Willow Flycatcher (WIFL)**: Band number 2750-76913 49 .

For comparison, the species captured most frequently in the 2016 records included the **Myrtle Warbler (MYWA)** and the **Gray Catbird (GRCA)**, which both had dozens of capture entries

Query 3

What are the trends in the NOCA data for 2016?

Data Analysis: The Good

Query 3: What are the trends in the NOCA data for 2016?

2. Age Structure

Age distribution shows a strong skew toward **Age 2** birds.

Age Code	Count
2	38
1	13
5	4
U (unknown)	3

3. Sex Ratio

Sex	Count
Female	33
Male	23
Unknown	2

ChatGPT



Sex		Age	
F	33	1 (<i>AHY</i>)	13
M	23	2 (<i>HY</i>)	38
U	2	5 (<i>SY</i>)	4
Total	58	U	3
		Total	58

Manually counted

Data Analysis: The Good

Query 3: What are the trends in the NOCA data for 2016?

2. Age Structure

Age distribution shows a strong skew toward young birds.

Age Code	Count
----------	-------

2	38
---	----

1	13
---	----

5	4
---	---

U (unknown)	3
-------------	---



Fun Tidbit

3. Sex Ratio

Sex	Count
-----	-------

Female	33
--------	----

Male	23
------	----

Unknown	2
---------	---

Age is a mess.

Sex	
F	33
M	23
U	2
Total	58

Age	
1 (AHY)	13
2 (HY)	38
5 (SY)	4
U	3
Total	58

Manually counted

Data Analysis: The Good Iffy

Query 3: What are the trends in the NOCA data for 2016?

2. Age Structure

Age distribution shows a strong skew toward **Age 2** birds.

Age Code	Count
2	38
1	13
5	4
U (unknown)	3

Trend:

- **Age 2 birds dominate** ($\approx 66\%$) of captures.
- **Relatively few older birds (Age 5)** were captured.
- Suggests **strong representation of second-year birds** in the

Unknown

2

ChatGPT



Sex		Age	
F	33	1 (AHY)	13
M	23	2 (HY)	38
U	2	5 (SY)	4
Total	58	U	3
		Total	58

Manually counted

Data Analysis: The Good Iffy

Query 3: What are the trends in the NOCA data for 2016?

NOCA (Northern Cardinal) Trends for 2016

Here are the key trends identified in the data:

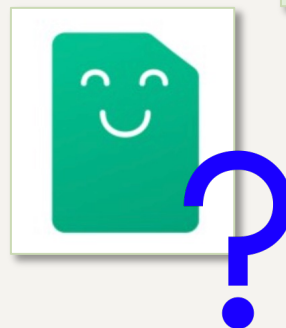
1. Sex Distribution

- **Female-biased:** 56.9% female (33 birds) vs. 39.7% male (23 birds)
- 2 birds of unknown sex (3.4%)
- Clear female predominance in captures

2. Age Distribution

- **Heavily dominated by age-2 birds:** 65.5% (38 birds) — mostly juveniles from the previous breeding season
- Age-1 birds: 22.4% (13 birds) — birds from the current year
- Older birds (Age-5): 6.9% (4 birds) — very few long-lived birds recaptured
- 3 birds of unknown age (5.2%)

FormulaBot



Sex		Age	
F	33	1 (AHY)	13
M	23	2 (HY)	38
U	2	5 (SY)	4
Total	58	U	3
		Total	58

Manually counted

Data Analysis: The Good Iffy

Query 3: What are the trends in the NOCA data for 2016?

Sex		Age	
F	33	1 (<i>AHY</i>)	13
M	23	2 (<i>HY</i>)	38
U	2	5 (<i>SY</i>)	4
Total	58	U	3
		Total	58

Manually counted

Sex & Age Females outnumbered males considerably: 33F vs. 23M (plus 2 unknown). In terms of age, the majority (38) were coded as age 2 (second-year birds), with 13 age 1 (hatch-year), 4 age 5 (definitive adult), and 3 unknown — suggesting a lot of young birds moving through in fall.

Claude



Data Analysis: The Good Iffy

Query 3: What are the trends in the NOCA data for 2016?

Here's a summary of **NOCA (Northern Cardinal)** trends for 2016:

Overall

- **58 total captures** across the year

Sex Distribution

- **Females dominated:** 33 (57%) vs. 23 males (40%), with 2 unsexed

Age Distribution

- **Age 2 (hatching year/second year)** was most common with 38 captures (66%), suggesting strong recruitment of younger birds
- Age 1: 13 | Age 5 (after second year): 4 | Unknown: 3

Sex		Age	
F	33	1 (<i>AHY</i>)	13
M	23	2 (<i>HY</i>)	38
U	2	5 (<i>SY</i>)	4
Total	58	U	3
		Total	58

Manually counted

Quadratic



Data Analysis: The Good Iffy

Query 3: What are the trends in the NOCA data for 2016?

Demographic Breakdown

Age Group	Male	Female	Unknown	Total
Age 1 (Hatch Year)	6	7	0	13
Age 2 (Second Year)	15	21	2	38
Age 5 (After Hatch Year)	1	3	0	4
Age U (Unknown)	1	2	0	3
Total	23	33	2	58

Sex		Age	
F	33	1 (AHY)	13
M	23	2 (HY)	38
U	2	5 (SY)	4
Total	58	U	3
		Total	58

Manually counted

NotebookLM



Data Analysis: The Good Iffy

Query 3: What are the trends in the NOCA data for 2016?

NOCA (2016) — key trends

- **Total captures: 58**

Seasonality & timing

- Peak month: **Oct (18 captures)**; captures concentrated in **Apr–Jul** and **Oct** (very low in Aug).
- Peak hour: **07:00** (captures cluster in the early morning).

Demographics

- Sex: **F 33 (57%), M 23 (40%), U 2 (3%)**.
- Age: **2 = 38 (66%), 1 = 13 (22%), 5 = 4 (7%), U = 3 (5%)**.

Biometrics (typical ranges)

- **WT**: median **41.7** (P25–P75: **40.2–42.9**), range **36.8–47.2** (n=57).
- **WC**: median **89** (P25–P75: **87–91**), range **82–97** (n=58).
- **TL**: median **96** (P25–P75: **92–100**), range **85–104** (n=49).
- **Fat**: mostly **0** (median 0; max 1). **2 records** flagged as potential outliers (IQR method).

Locations

- Top locations: **HW39 (6), HW41 (6), HW00 (4), HW13 (3), HW06 (2)**.

Sex		Age	
F	33	1 (AHY)	13
M	23	2 (HY)	38
U	2	5 (SY)	4
Total	58	U	3
		Total	58

Manually counted

Rows AI



Query 4

Calculate basic stats to compare M&F NOCA captured from 2015-2017.

Data Analysis: The Good (mostly)

Query 4:
Calculate basic
stats to
compare M&F
NOCA (over 3
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	77	77	77	77	77	77	77
		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

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		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
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		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

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		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

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		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

Data Analysis: The Good (mostly)

Query 4:
Calculate basic
stats to
compare M&F
NOCA (over 3
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	77	77	77	77	77	77	77
		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

Data Analysis: The Good (mostly)

Query 4:
Calculate basic
stats to
compare M&F
NOCA (over 3
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	77	77	77	77	77	77	77
		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

Data Analysis: The Good (mostly)

Query 4:
Calculate basic
stats to
compare M&F
NOCA (over 3
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	77	77	77	77	77	77	77
		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

Data Analysis: The Good (mostly)

Query 4:
Calculate basic
stats to
compare M&F
NOCA (over 3
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	77	77	77	77	77	77	77
		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.56	90.71	90.71	90.71
		F	88.85	88.85	88.85	88.80	88.85	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.64	42.49	42.49	42.49
		F	40.84	40.84	40.84	41.02	40.84	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	2.65	3.39	3.39	3.39
		F	2.70	2.70	2.70	3.38	2.70	2.70	2.70
	Weight	M	1.94	1.94	1.94	2.02	1.94	1.94	1.94
		F	2.24	2.24	2.24	2.56	2.24	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

Data Analysis: The Good (Movie)

Query 4:
Calculate basic
stats to
compare M&F
NOCA (over 3
years).

$$d.f. = n_1 + n_2 - 2$$

Typical equation for degrees of freedom.

Assumes equal variance between samples.

$$d.f. \approx \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$$

These samples have unequal variance.

This equation is more appropriate.

			Non-Al	Chloro	Clude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	F	77	77	77	77	77	77	77
	Weight	M	76	76	76	76	76	76	76
Mean	Wing Chord	F	79	79	79	79	79	79	79
		M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
	Weight	F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
		M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
Standard Deviation	Wing Chord	F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
		M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
	Weight	F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
		M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
Degrees of Freedom	Wing Chord	F	2.24	2.24	2.24	2.24	2.24	2.24	2.24
		M	145.02	145.02	145.02	145.02	154	145.02	145.02
	Weight	F	151.36	151.36	151.36	151.36	153	151.36	151.36
		M	3.79	3.79	3.80	3.80	3.61	3.79	3.79
t-stat	Wing Chord	F	4.91	4.91	4.90	4.90	4.37	4.92	4.91
	Weight	F	4.91	4.91	4.90	4.90	4.37	4.92	4.91

Data Analysis: The Good (mostly)

Query 4:
Calculate basic stats to compare M&F NOCA (over 3 years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	77	77	77	77	77	77	77
		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.56	90.71	90.71	90.71
		F	88.85	88.85	88.85	88.80	88.85	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.64	42.49	42.49	42.49
		F	40.84	40.84	40.84	41.02	40.84	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	2.65	3.39	3.39	3.39
		F	2.70	2.70	2.70	3.38	2.70	2.70	2.70
	Weight	M	1.94	1.94	1.94	2.02	1.94	1.94	1.94
		F	2.24	2.24	2.24	2.56	2.24	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

Data Analysis: The Good (mostly)

Query 4:
Calculate basic
stats to
compare M&F
NOCA (over 3
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	77	77	77	77	77	77	77
		F	79	79	79	79	79	79	79
	Weight	M	76	76	76	76	76	76	76
		F	79	79	79	79	79	79	79
Mean	Wing Chord	M	90.71	90.71	90.71	90.71	90.56	90.71	90.71
		F	88.85	88.85	88.85	88.85	88.80	88.85	88.85
	Weight	M	42.49	42.49	42.49	42.49	42.64	42.49	42.49
		F	40.84	40.84	40.84	40.84	41.02	40.84	40.84
Standard Deviation	Wing Chord	M	3.39	3.39	3.39	3.39	2.65	3.39	3.39
		F	2.70	2.70	2.70	2.70	3.38	2.70	2.70
	Weight	M	1.94	1.94	1.94	1.94	2.02	1.94	1.94
		F	2.24	2.24	2.24	2.24	2.56	2.24	2.24
Degrees of Freedom	Wing Chord		145.02	145.02	154	154	154	145.02	145.02
	Weight		151.36	151.36	153	153	153	151.36	151.36
t-stat	Wing Chord		3.79	3.79	3.80	3.80	3.61	3.79	3.79
	Weight		4.91	4.91	4.90	4.90	4.37	4.92	4.91

Query 4.5

Calculate basic stats to compare M&F NOCA
for all years (2004-2022).

Data Analysis: The Good ~~Bad~~

Query 5:
Calculate basic
stats to
compare M&F
NOCA (over all
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	683	678	678	666	454	678	678
		F	849	846	846	840	542	846	846
	Weight	M	799	770	770	758	451	770	770
		F	960	928	928	922	538	928	928
Mean	Wing Chord	M	90.89	91.06	91.06	91.07	91.24	91.06	91.06
		F	88.85	88.90	88.90	88.90	88.61	88.90	88.90
	Weight	M	42.31	42.52	42.52	42.51	42.87	42.52	42.52
		F	41.25	41.28	41.28	41.29	41.22	41.28	41.28
Standard Deviation	Wing Chord	M	3.76	3.18	3.18	3.19	3.15	3.18	3.18
		F	2.94	2.79	2.79	2.80	2.82	2.79	2.79
	Weight	M	3.52	2.72	2.72	2.72	2.54	2.72	2.72
		F	3.22	2.95	2.95	2.96	3.02	2.95	2.95
Degrees of Freedom	Wing Chord		1271.10	1357.77	1522	1504	994	1357.77	1357.77
	Weight		1635.91	1676.73	1696	1678	987	1676.73	1676.73
t-stat	Wing Chord		11.60	13.89	14.08	14.07	13.78	13.89	13.89
	Weight		6.52	8.96	8.89	8.77	9.24	8.96	8.96

Data Analysis: The ~~Good~~ Bad

Query 5:
Calculate basic
stats to
compare M&F
NOCA (over all
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	683	678	678	666	454	678	678
		F	849	846	846	840	542	846	846
	Weight	M	799	770	770	758	451	770	770
		F	960	928	928	922	538	928	928
Mean	Wing Chord	M	90.89	91.06	91.06	91.07	91.24	91.06	91.06
		F	88.85	88.90	88.90	88.90	88.61	88.90	88.90
	Weight	M	42.31	42.52	42.52	42.51	42.87	42.52	42.52
		F	41.25	41.28	41.28	41.29	41.22	41.28	41.28
Standard Deviation	Wing Chord	M	3.76	3.18	3.18	3.19	3.15	3.18	3.18
		F	2.94	2.79	2.79	2.80	2.82	2.79	2.79
	Weight	M	3.52	2.72	2.72	2.72	2.54	2.72	2.72
		F	3.22	2.95	2.95	2.96	3.02	2.95	2.95
Degrees of Freedom	Wing Chord		1271.10	1357.77	1522	1504	994	1357.77	1357.77
	Weight		1635.91	1676.73	1696	1678	987	1676.73	1676.73
t-stat	Wing Chord		11.60	13.89	14.08	14.07	13.78	13.89	13.89
	Weight		6.52	8.96	8.89	8.77	9.24	8.96	8.96

Data Analysis: The Good ~~Good~~ Bad

Query 5:
Calculate basic
stats to
compare M&F
NOCA (over all
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	683	678	678	666	454	678	678
		F	849	846	846	840	542	846	846
	Weight	M	799	770	770	758	451	770	770
		F	960	928	928	922	538	928	928
Mean	Wing Chord	M	90.89	91.06	91.06	91.07	91.24	91.06	91.06
		F	88.85	88.90	88.90	88.90	88.61	88.90	88.90
	Weight	M	42.31	42.52	42.52	42.51	42.87	42.52	42.52
		F	41.25	41.28	41.28	41.29	41.22	41.28	41.28
Standard Deviation	Wing Chord	M	3.76	3.18	3.18	3.19	3.15	3.18	3.18
		F	2.94	2.79	2.79	2.80	2.82	2.79	2.79
	Weight	M	3.52	2.72	2.72	2.72	2.54	2.72	2.72
		F	3.22	2.95	2.95	2.96	3.02	2.95	2.95
Degrees of Freedom	Wing Chord		1271.10	1357.77	1522	1504	994	1357.77	1357.77
	Weight		1635.91	1676.73	1696	1678	987	1676.73	1676.73
t-stat	Wing Chord		11.60	13.89	14.08	14.07	13.78	13.89	13.89
	Weight		6.52	8.96	8.89	8.77	9.24	8.96	8.96

Data Analysis: The ~~Good~~ Bad

Query 5:
Calculate basic
stats to
compare M&F
NOCA (over all
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	683	678	678	666	454	678	678
		F	849	846	846	840	542	846	846
	Weight	M	799	770	770	758	451	770	770
		F	960	928	928	922	538	928	928
Mean	Wing Chord	M	90.89	91.06	91.06	91.07	91.24	91.06	91.06
		F	88.85	88.90	88.90	88.90	88.61	88.90	88.90
	Weight	M	42.31	42.52	42.52	42.51	42.87	42.52	42.52
		F	41.25	41.28	41.28	41.29	41.22	41.28	41.28
Standard Deviation	Wing Chord	M	3.76	3.18	3.18	3.19	3.15	3.18	3.18
		F	2.94	2.79	2.79	2.80	2.82	2.79	2.79
	Weight	M	3.52	2.72	2.72	2.72	2.54	2.72	2.72
		F	3.22	2.95	2.95	2.96	3.02	2.95	2.95
Degrees of Freedom	Wing Chord		1271.10	1357.77	1522	1504	994	1357.77	1357.77
	Weight		1635.91	1676.73	1696	1678	987	1676.73	1676.73
t-stat	Wing Chord		11.60	13.89	14.08	14.07	13.78	13.89	13.89
	Weight		6.52	8.96	8.89	8.77	9.24	8.96	8.96

Data Analysis: The Good Bad

Query 5:

Calculate basic stats to compare M&F NOCA (over all years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	683	678	678	666	454	678	678
		F	849	846	846	840	542	846	846
	Weight	M	799	770	770	758	451	770	770
		F	960	928	928	922	538	928	928
Mean	Wing Chord	M	90.89	91.06	91.06	91.07	91.24	91.06	91.06
		F	88.85	88.90	88.90	88.90	88.61	88.90	88.90
	Weight	M	42.31	42.52	42.52	42.51	42.87	42.52	42.52
		F	41.25	41.28	41.28	41.29	41.22	41.28	41.28
Standard Deviation	Wing Chord	M	3.76	3.18	3.18	3.19	3.15	3.18	3.18
		F	2.94	2.79	2.79	2.80	2.82	2.79	2.79
	Weight	M	3.52	2.72	2.72	2.72	2.54	2.72	2.72
		F	3.22	2.95	2.95	2.96	3.02	2.95	2.95
Degrees of Freedom	Wing Chord		1271.10	1357.77	1522	1504	994	1357.77	1357.77
	Weight		1635.91	1676.73	1696	1678	987	1676.73	1676.73
t-stat	Wing Chord		11.60	13.89	14.08	14.07	13.78	13.89	13.89
	Weight		6.52	8.96	8.89	8.77	9.24	8.96	8.96

Data Analysis: The ~~Good~~ Bad

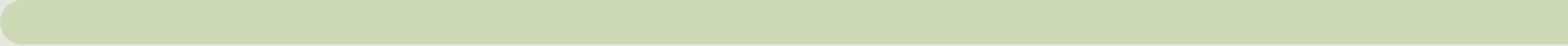
Query 5:
Calculate basic
stats to
compare M&F
NOCA (over all
years).

			Non-AI	ChatGPT	Claude	FormulaBot	NotebookLM	Quadratic	Rows AI
Observations	Wing Chord	M	683	678	678	666	454	678	678
		F	849	846	846	840	542	846	846
	Weight	M	799	770	770	758	451	770	770
		F	960	928	928	922	538	928	928
Mean	Wing Chord	M	90.89	91.06	91.06	91.07	91.24	91.06	91.06
		F	88.85	88.90	88.90	88.90	88.61	88.90	88.90
	Weight	M	42.31	42.52	42.52	42.51	42.87	42.52	42.52
		F	41.25	41.28	41.28	41.29	41.22	41.28	41.28
Standard Deviation	Wing Chord	M	3.76	3.18	3.18	3.19	3.15	3.18	3.18
		F	2.94	2.79	2.79	2.80	2.82	2.79	2.79
	Weight	M	3.52	2.72	2.72	2.72	2.54	2.72	2.72
		F	3.22	2.95	2.95	2.96	3.02	2.95	2.95
Degrees of Freedom	Wing Chord		1271.10	1357.77	1522	1504	994	1357.77	1357.77
	Weight		1635.91	1676.73	1696	1678	987	1676.73	1676.73
t-stat	Wing Chord		11.60	13.89	14.08	14.07	13.78	13.89	13.89
	Weight		6.52	8.96	8.89	8.77	9.24	8.96	8.96

And the winner is...

		About the dataset	Least frequent	NOCA trends	Age categories	Basic stats
ChatGPT		✓	?	✓	✗	?
Claude		✓	?	✓	✗	✗
Formula Bot		✓	✗	✓	✗	✗
Notebook LM		✓	✓	✓	✗	✗
Quadratic		✓	?	✓	✗	?
Rows AI		✓	✓	✓	—	?

Final Tally



**As with all generative AI
tools, use with caution.**

Mistakes will be made; untrained researchers are unlikely to notice.



Thank you!

Questions?

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Avian Research & Education Institute
(and all AREI affiliates)

Link to cited references:

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