

Analysis of rank-score data for the TU Delft Aerospace Selection Process *

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v1: 2023-04-15

v2: 2024-04-14

v3: 2025-03-23

Abstract

The exam scores on the TU Delft Aerospace Selection process are released a day before the ranks are. This day of waiting is usually extremely painful and to get around that, I have collected and compiled data from various discord and whatsapp channels to produce this document. I dont know what i am doing, so take it with a huge pinch of salt, and please do suggest better methodology. Compiling this data will be only the simplest step we can take in understanding how the entrance process really works, as very little information about it is released to the public.

Source: <https://github.com/erentar/tud-aero-selection-rankings>

*Special thanks to Django van der Plas and everyone on the TU Delft Study server. If at any time the word “we” is used, it refers to my conversations with various people in the server.

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Data for previous years

Data collection

I went into all of the TU Delft discords i know of, searched for “rank”. Clusters of messages around activity spikes (usually over a few days) included a lot of screenshots of scores with ranks included. These were added to a spreadsheet data.ods, and used to create following plots.

Analysis

Expected distribution would be a gaussian distribution. Ranking each member would involve finding the percentile of every point on this gaussian distribution, i.e how many people are above them. Cumulative distribution function of the normal distribution would give percentile of every point. To find this, one would integrate the normal distribution.

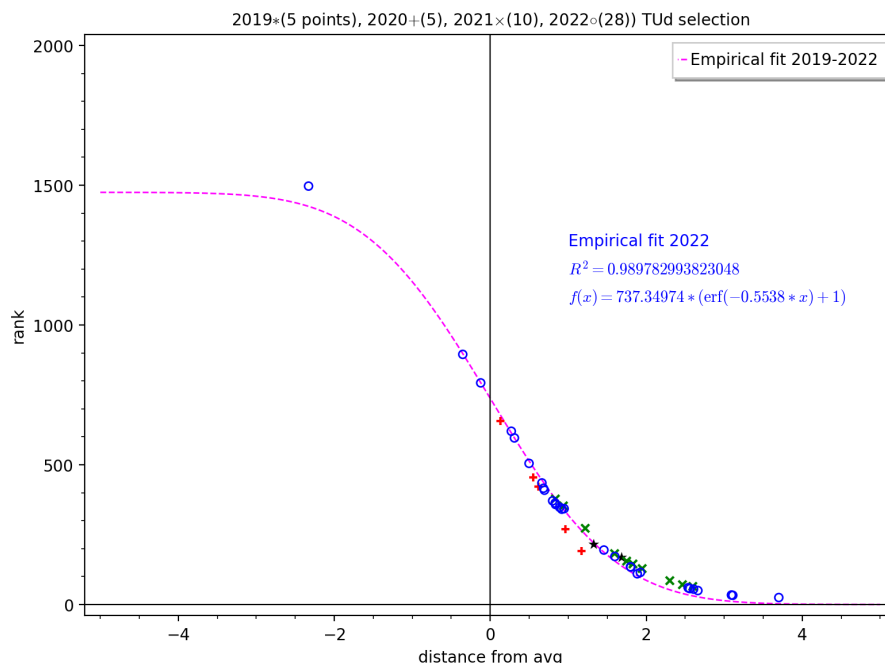
Thus, the cumulative distribution function is equivalent to the indefinite integral of the gaussian distribution, which is known as the error function erf.

The scavenged data was already ranked, the expected fit would be an erf fit.

To find the model below, [sagemath](#) is used.

```
var("a,b")
model(x) = a * ( erf(b*x)+1 )
fit1 = find_fit(year:list,model)
```

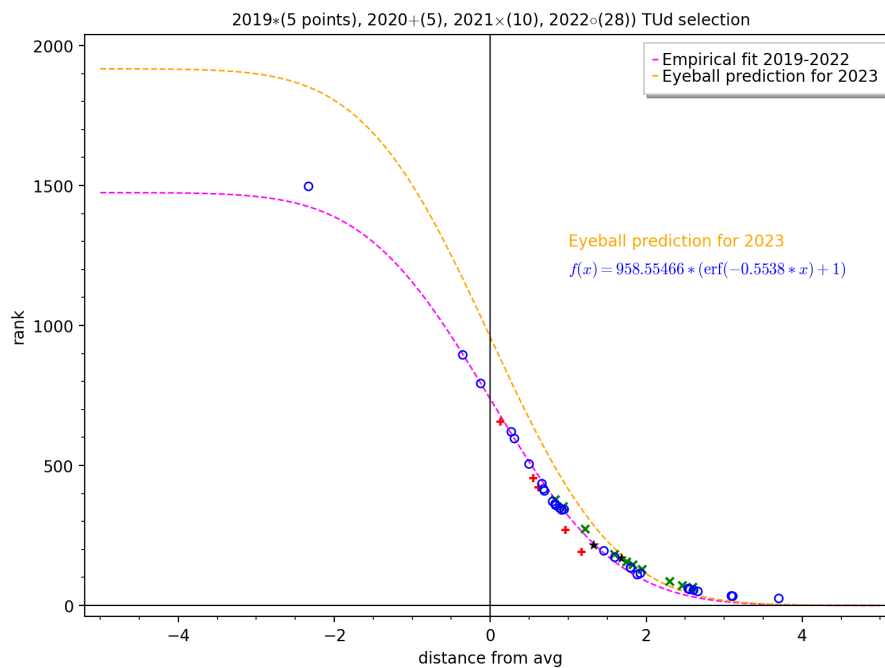
The full code (although not of high quality,) can be inspected in the source of this document.



This model seemed to be accurate to within 40 ranks when tried with data not included in the training set.

This model will be inaccurate when applied blindly to 2023 ranks, due to higher amount of people applying, as lowest rank would be higher. To have a rough idea of the landscape in 2023, we scale the model by increasing the first coefficient by the factor expected.

The ceiling (i.e the lowest rank) for 2022 was 1600. We had naively eyeballed that about 1.2-1.4 times as much people would apply this year (without any backing evidence). Thus, scaling the function respectively (by a factor of 1.3) would yield



As will be laid out in a later section, this turned out to be accurate as long as the scaling factor is correct.

Data for 2023

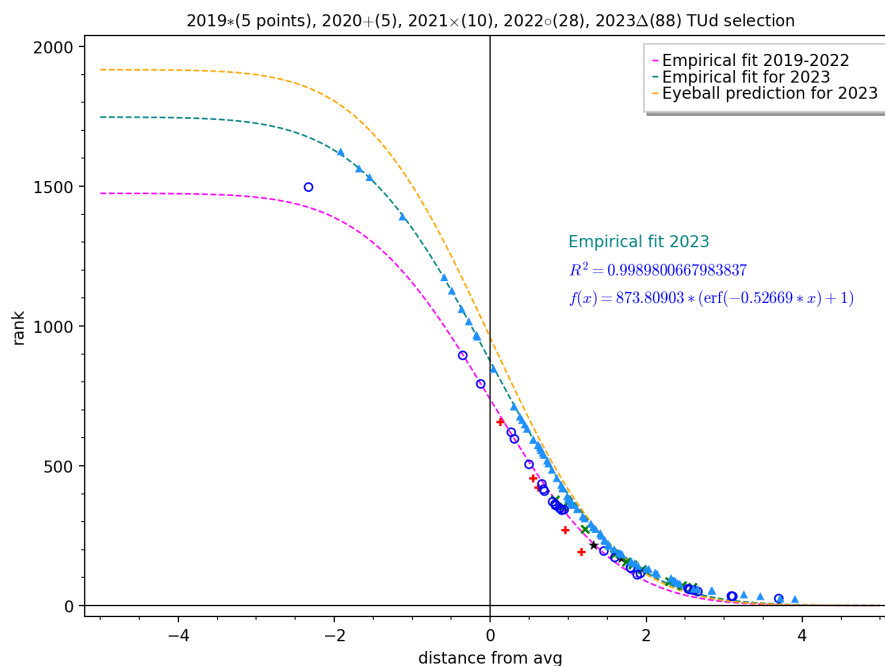
Data collection

Spammed google form <https://forms.gle/tzp7KgC5CznU8Q7VA> at the TU Delft discords, and also the whatsapp chat for 2023 applicants. Apologies for the annoyance.

I am willing to say it paid off, because as of 2023-04-16, there are 92 responses (some of which were unusable due to trolling and/or invalid entries), which is great. Thanks to everyone who participated and donated data. I wish i could credit everyone individually. The persons who included their name will be in the thanks section.

Analysis

Same as the previous section, data is different while the code is identical.



Playing around

Now that i knew the fit line for 2023, i had a rough idea how many more people applied.

My fit for 2019-2022 yielded

1474.6994782364534

as the lowest rank.

The e-mail sent last year showed that 2300 people applied and about 1800 finished the mini-mooc. I suspect that some people dropped after that as well, however a drop of

325.3005217635466

seems a little too much.

Yet still, let us assume this number is correct for now.

The highest rank yielded by the 2023 fit is

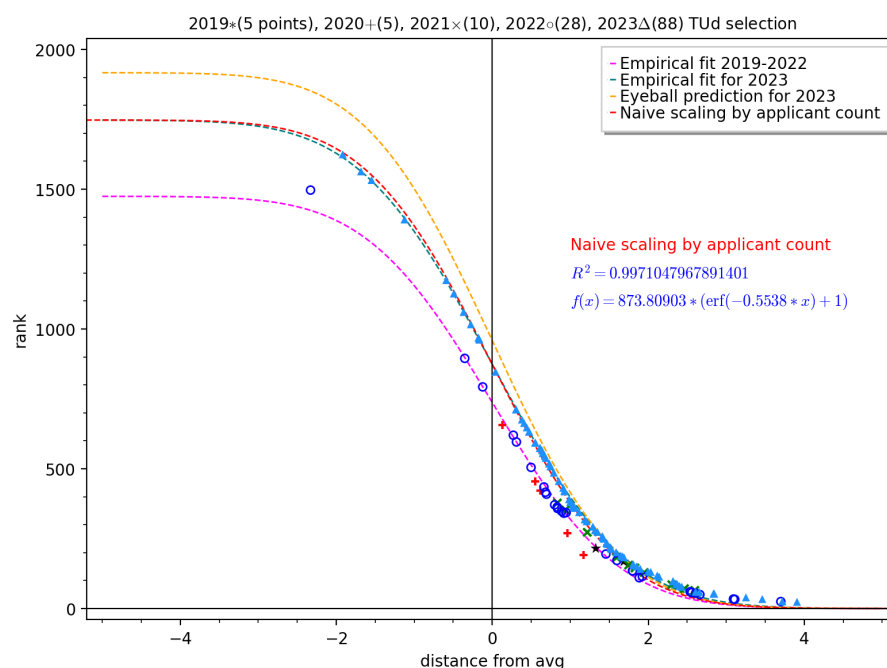
1747.6180518955043

If we are to assume this number is correct,

1.1850672477252284

times as much people applied.

My eyeball estimation was 1.3 times. Instead if my naive prediction had used the number above as the coefficient, the following line would appear

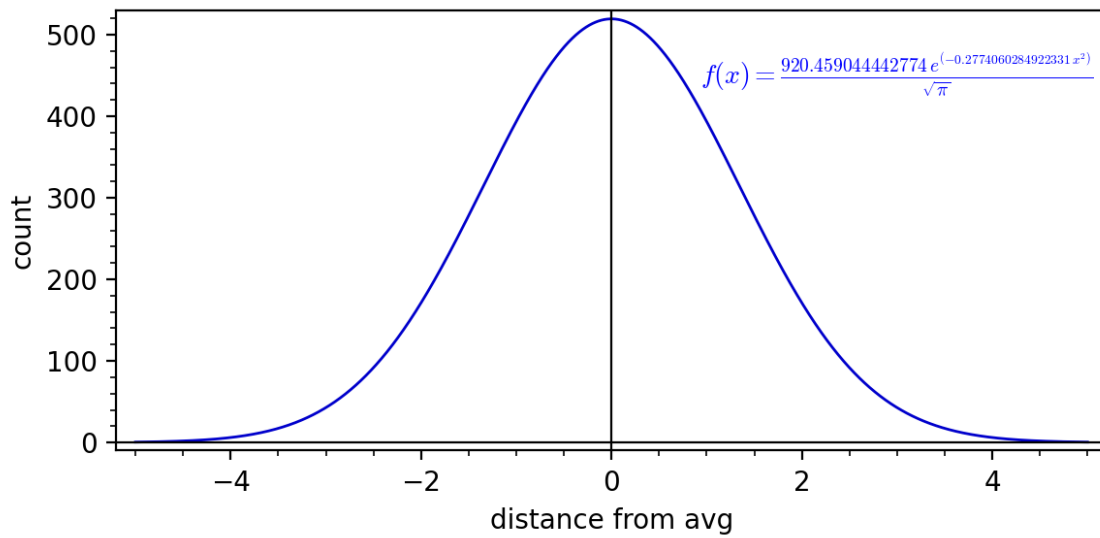


This is very accurate, probably because the underlying statistical distribution didnt change much.

Extracting statistical characteristics of the fit

The fit provided is a numerical fit, and does not give the standard deviation.

Deriving the fit would yield the underlying bell curve, as can be seen below



The standard deviation is found by solving

$$-1 * \frac{d}{dx}(\text{fit2023}) == \text{ceil2023} * \frac{1}{\sigma * \sqrt{2\pi}} * \exp\left(-\frac{1}{2} * \left(\frac{x}{\sigma}\right)^2\right)$$

which yields

$$\sigma = 1.34253944581253$$

Conclusion

Predicting rank using this methodology, i.e getting the last year's curve and scaling it proportionally to this year's applicant count, seems to work reliable enough for estimating whether one gets in or not.

The greatest limiting factor in applying this method to future years would be the fact that the applicant counts are not released, makes this method rather inaccurate.

2024, new system

This year the exam system was changed significantly. There are now two sections, “aptitude” (formerly motivation) and “academic”. Aptitude counts for 40% of the grade, and academic counts for 60%. The academic test is 30% math, 30% physics, and 40% fym.

The aptitude test

The aptitude test is prepared and administered by [NOA-VU](#).¹ It comprises of 3 sections:

- Study Motivation Test (SMT)
- [MPT-Study](#)
- Study orientation and expectations questionnaire

I was unable to find the matching webpages for the other two tests.

People of interest:

- Corine Sonke
- Rik Hoogland
- Edwin van den Akker

SMT

This section asks the candidate to rank listed 3 statements by how well it applies to them. There are 35 questions, and the cards to be ranked are often repeated.

I suspect all of the rankings of statements are combined to form a ranked list with all the statements. The fact that the candidate has to do this in bursts of 3 makes it significantly more difficult to ensure the statement you actually want ends on the top.

$$\{a > b > c\} \oplus \{d > a > c\} = \{d > a > b > c\}$$

¹The total list of all tests offered by NOA-VU is available at <https://noa-vu.com/products/online-tests/overview-single-tests/>

MPT-Study

Each question is presented with 5 possible answers: disagree, slightly disagree, neutral, slightly agree, agree.

There have been similar tests like this.² In this style of test, there is one side to the answers that is considered desirable. How close you are to the desirable side determines your score.

On [NOA-VU's webpage](#), listed personality traits are Emotional stability, Extraversion, Conscientiousness, Openness, Agreeableness, Integrity.

A paper published by NOA-VU³ “spills the beans” that Conscientiousness and Integrity are considered strong predictors of GPA. This paper lists behaviours quite specifically. Another paper⁴ confirms this. Notably, having extracurricular or social ambitions are considered undesirable. As NOA-VU correlates test answers with GPA, this makes sense. However, one of the big reasons TUD opted to have *motivation* part of the exam system was because of the student culture and similar factors. Replacing the motivation section with a test that selects people to have no ambitions outside of study will affect the culture of the incoming student body, and ultimately the student culture of the entire faculty, badly.

Study questionnaire

The questionnaire has 8 questions and asks questions such as “I am excited to live in delft” and “How many information activities (on campus/online) have you attended”. These questions famously contributed quite a lot to your *motivation* score before the revamped system.

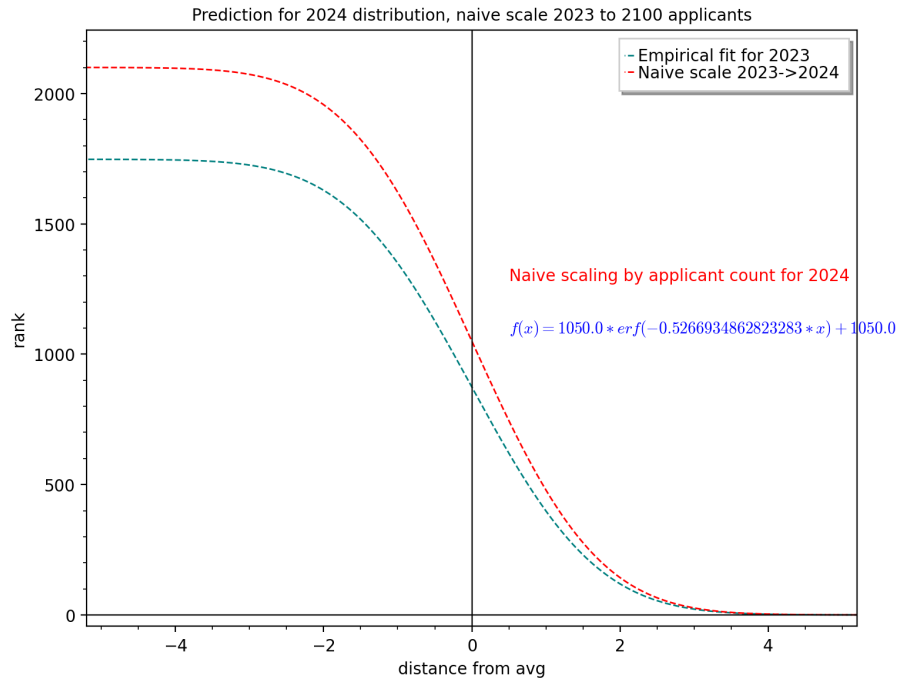
²Specifically, look at page 89. The key to the symbols is at page 85.
von Zerssen D, Pfister H, Koeller DM. The Munich personality test (MPT) — a short questionnaire for self-rating and relatives' rating of personality traits: Formal properties and clinical potential. Eur Arch Psychiatr Neurol Sci [Internet]. 1988 Mar 1 [cited 2025 Mar 22];238(2):73–93. Available from: <https://doi.org/10.1007/BF00452782>

³Specifically pages 345-347 are relevant
De Vries A, De Vries RE, Born MPH. Broad versus narrow traits: Conscientiousness and honesty-humility as predictors of academic criteria. Eur J Pers [Internet]. 2011 Sep [cited 2025 Mar 3];25(5):336–48. Available from: <https://journals.sagepub.com/doi/10.1002/per.795>

⁴Holtrop D, Born MPH, De Vries A, De Vries RE. A matter of context: A comparison of two types of contextualized personality measures. Personality and Individual Differences [Internet]. 2014 Oct [cited 2025 Mar 3];68:234–40. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0191886914002670>

Predictions

Since naive scaling to applicant count is the best guess, assuming the distribution characteristics have not changed.



This fit yields for the 440 cutoff point as being

1.08487207118712

This number is the distance from average. To get the score required for 440, we add the average score from 2024.

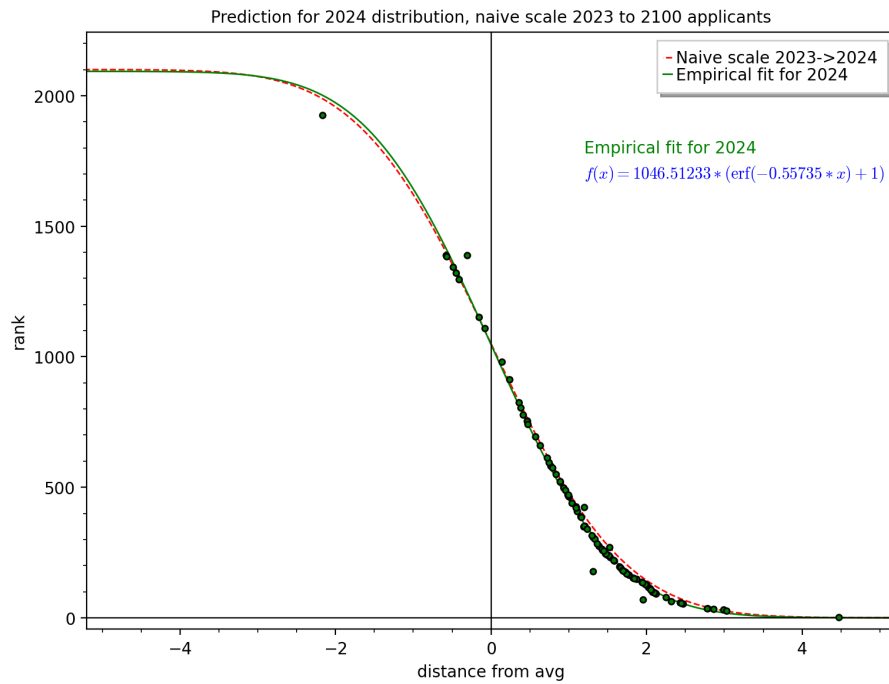
6.17287207118712

Based on this model, this is the score to be ranked 440.

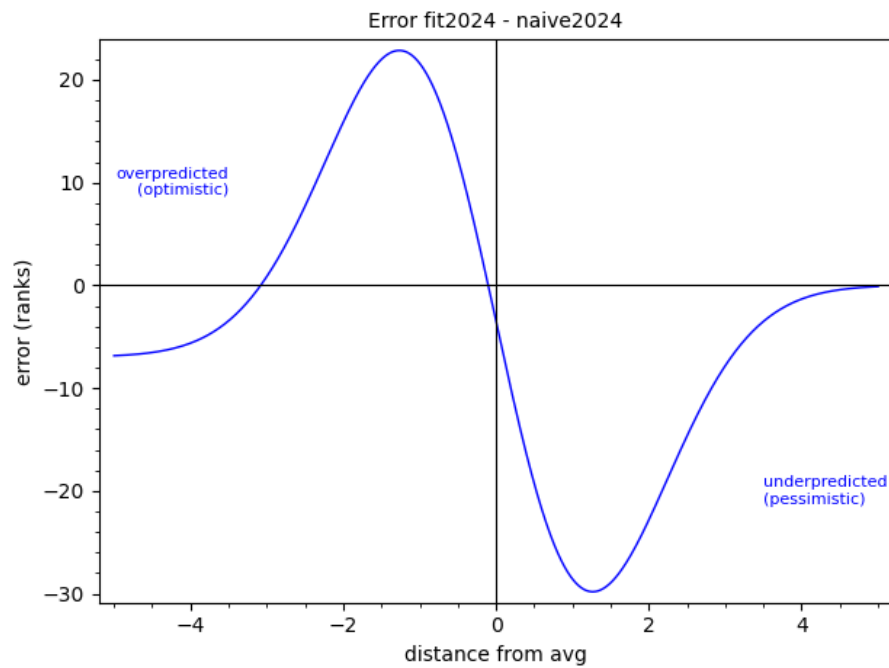
Comparison to empirical data

Data was collected in the exact same fashion as last year, spammed [this google form](#)

[raw data from the spreadsheet](#)
also at `data2024.ods`



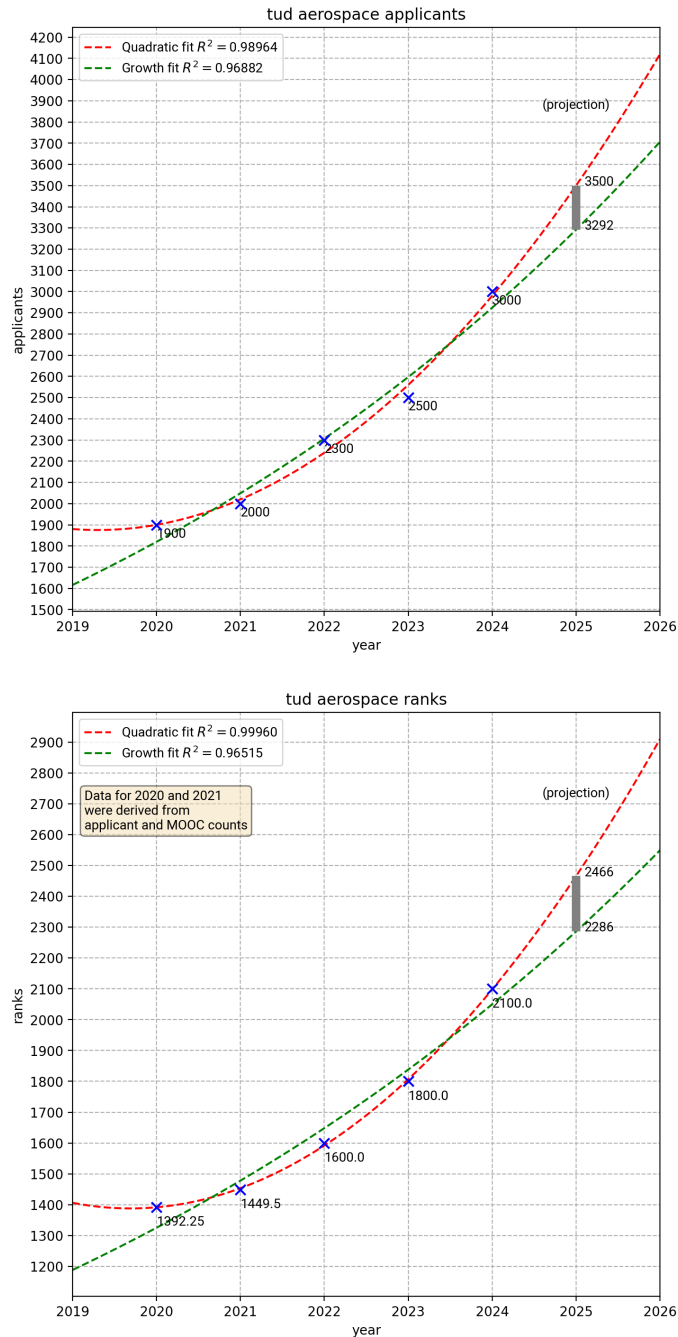
The error between the naive scale and empirical fit is shown below



thats pretty fuckin accurate

2025

For this year, applicant and rank counts trends were also compiled. This work is available under [applicantcount/](#).

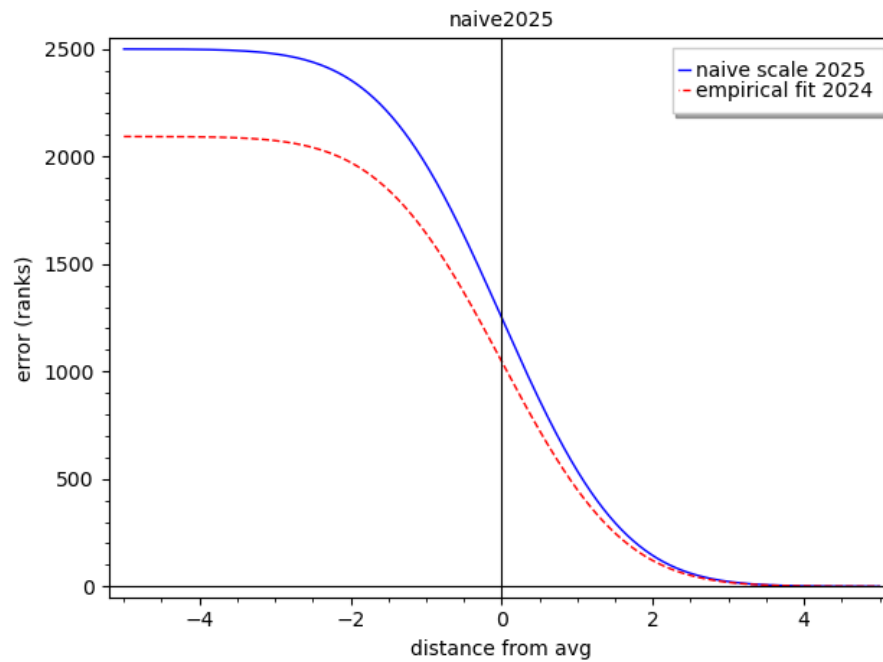


According to a photo sent on whatsapp⁵, the parabolic model is bang on. This is interesting, as there is no reason to expect the demand/interest to follow a parabolic model.

⁵This slide was in the deck shown in the dean's presentation for parent's day. <http://archive.org/details/whats-app-image-2025-03-21-at-19.55.19>

Prediction

same method as usual



naive scale yields the function

$x \mapsto 1250.0000000000002 * \text{erf}(-0.557351042823613 * x) + 1250.0000000000002$
for 2025.

one needs to score

1.18079310052316

points above the average to get rank 440