Aalto-yliopisto
Perustieteiden
korkeakoulu

Grades and birth month

Kristian

30.11.2022

Ohjaaja: *Jukka Kohonen*
Valvoja: *Jukka Kohonen*

Systeemianalyysin
laboratorio

Background

- Birth month affects
  - Success in sports
  - Bullying
  - ADHD diagnosis and medication
  - Google scholar gives up to two million results

(Tiiri, 2020; Gladwell, 2008)

Methodology

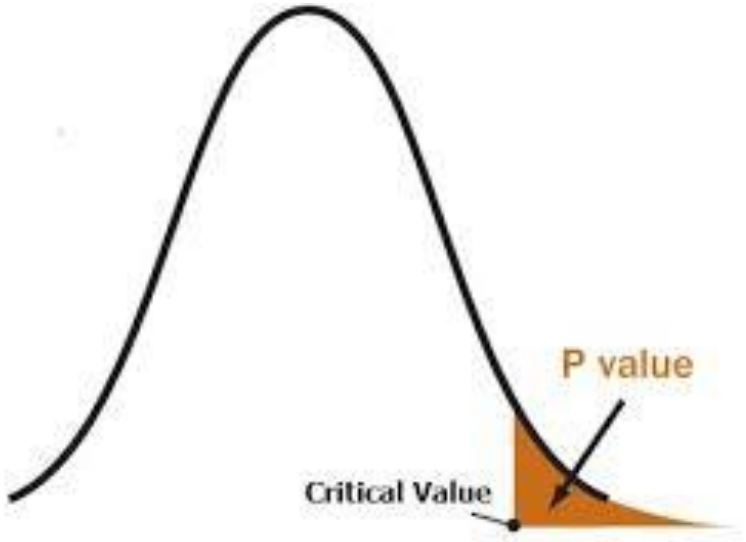
- We looked at two things
  - Grades compared head to head on a monthly, quarterly and semiannual basis
  - Monthly makeup of Aalto students vs. the Finnish baseline population

Vs.

(StatFin)

T-test (grade comparison)

$$t = \frac{\overline{x} - \overline{y}}{\sqrt{\frac{s_x^2}{n} + \frac{s_y^2}{m}}}$$

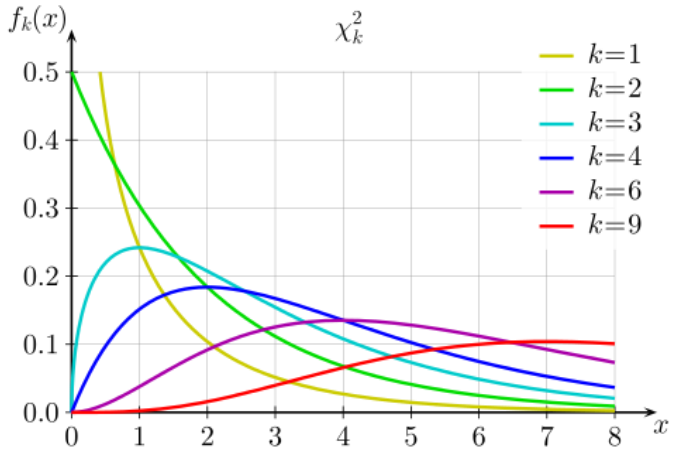


$\overline{x}, \overline{y}$ are the means ,s_x and s_y are the variances. n and m are the sample sizes of populations x and y

χ_g^2 – goodness of fit test (population comparison)

$$\chi_g{}^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

$n = 2, O_i$ is the observed number of students in a given month, E_i is the normalized proportion of students in the Finnish population

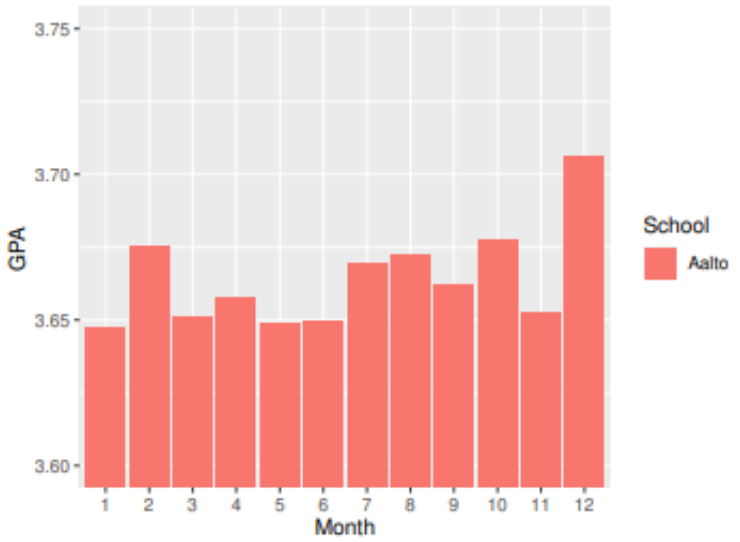


Bonferroni correction

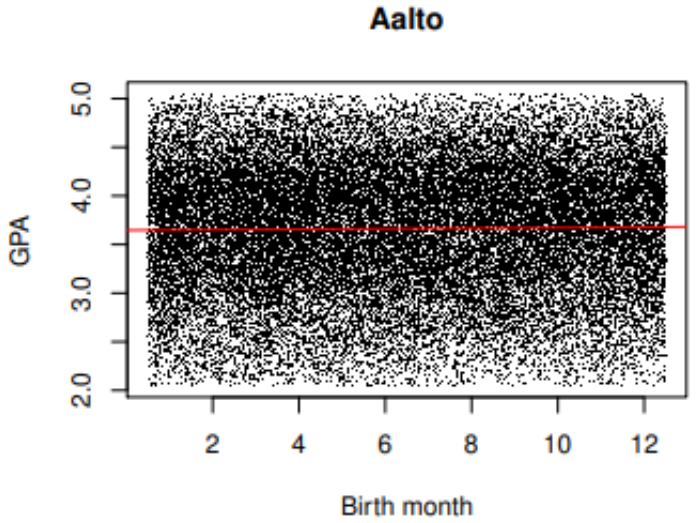
- When analysing a lot of data, naturally we're going to get some small p-values due to random chance
  - To correct this, we assume the p-values are uniformally distributed and we multiply each p-value by the number of tests we have done
  - If there's statistical significance, the p-values will still be statistically significant
  - Note, this is a conservative estimate

$$\text{Bonferroni constant} = \binom{12}{2} = 66$$

Mean GPA (all students)



(a) Mean GPAs



(b) Linear regression model of mean GPAs of individual students

Figure 3: Mean GPAs of different months.

Mean GPA (schoolwise)

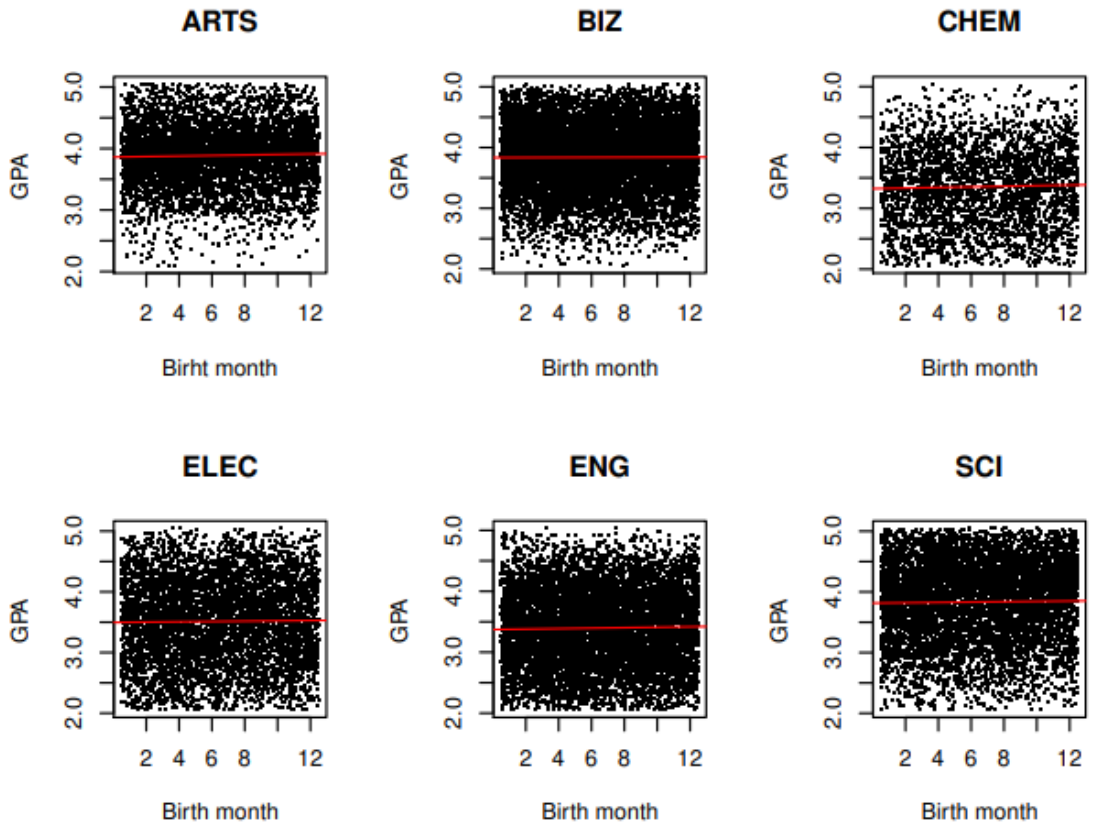
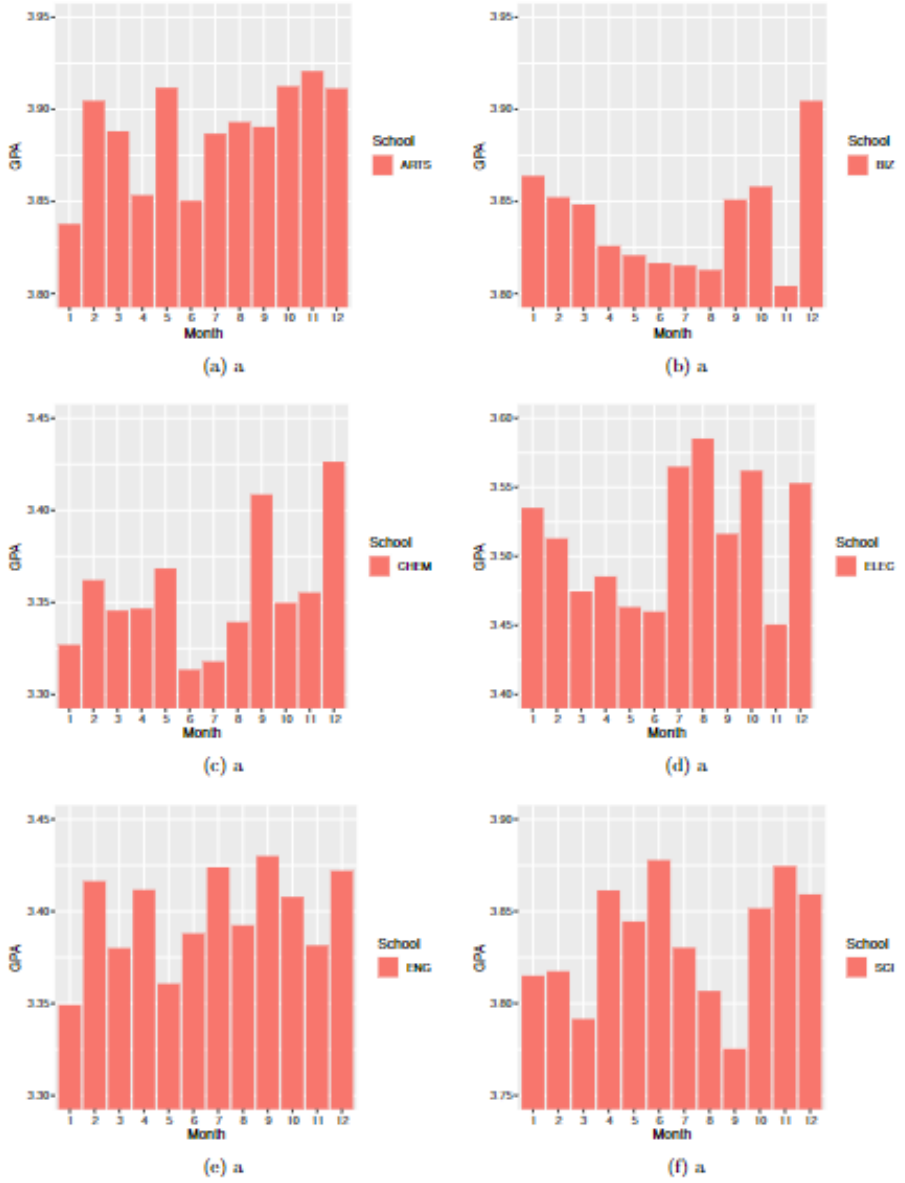


Figure 4: Linear regression model of every school in Aalto University

Mean GPA

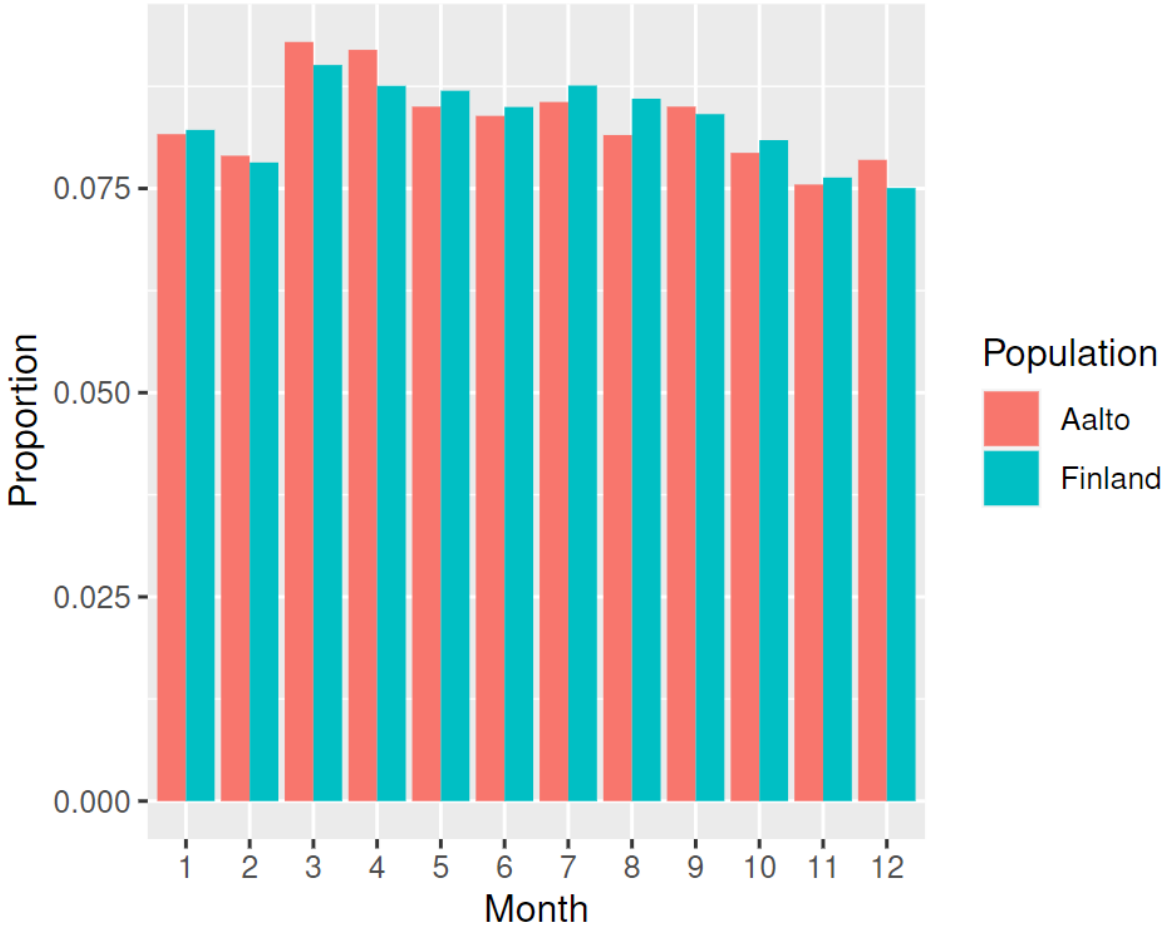
Table 1: GPAs of all schools of engineering on a monthly basis

Month	ARTS	BIZ	CHEM	ELEC	ENG	SCI
January	3.84	3.86	3.33	3.54	3.35	3.82
February	3.90	3.85	3.36	3.51	3.42	3.82
March	3.89	3.85	3.35	3.47	3.38	3.79
April	3.85	3.83	3.35	3.49	3.41	3.86
May	3.91	3.82	3.37	3.46	3.36	3.84
June	3.85	3.82	3.31	3.46	3.39	3.88
July	3.89	3.82	3.32	3.56	3.42	3.83
August	3.89	3.81	3.34	3.59	3.39	3.81
September	3.89	3.85	3.41	3.52	3.43	3.78
October	3.91	3.86	3.35	3.56	3.41	3.85
November	3.92	3.80	3.36	3.45	3.38	3.87
December	3.91	3.90	3.43	3.55	3.42	3.86

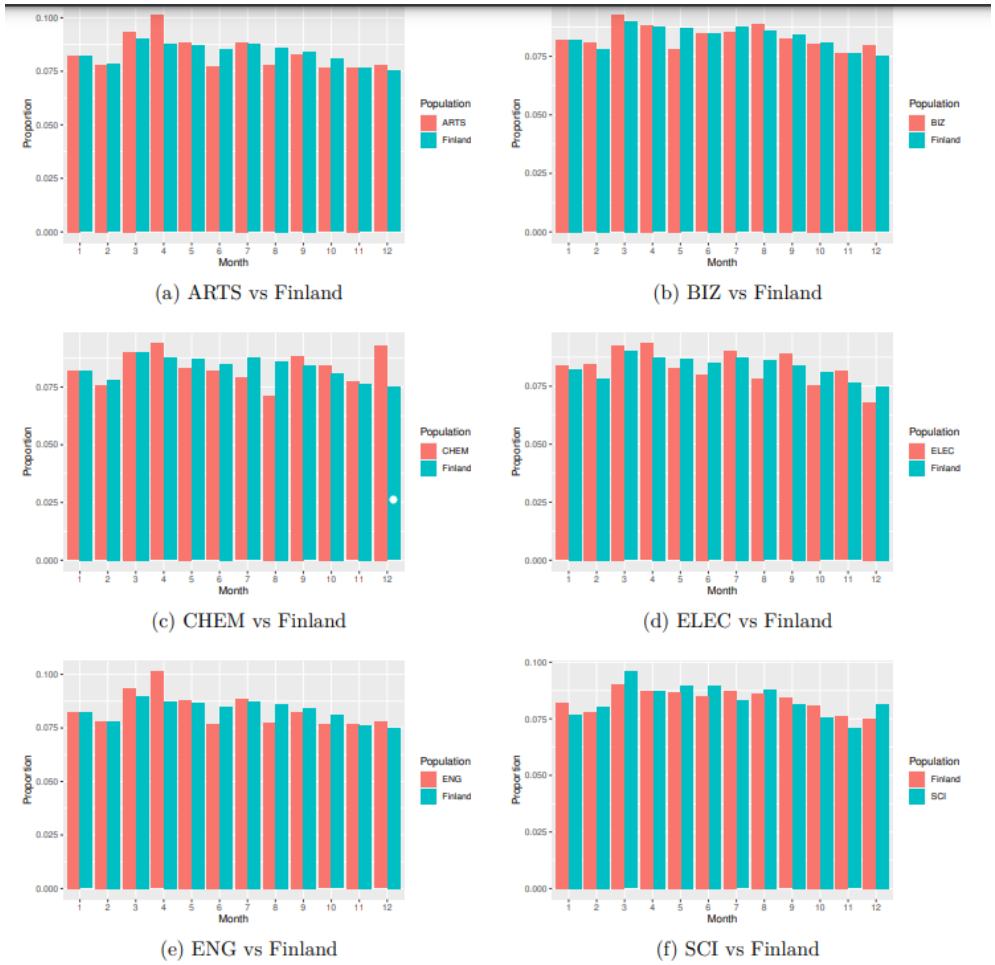


(a) a (b) a (c) a (d) a (e) a (f) a

Population comparison



Popoulation comparison



(a) ARTS vs Finland

(b) BIZ vs Finland

(c) CHEM vs Finland

(d) ELEC vs Finland

(e) ENG vs Finland

(f) SCI vs Finland

Results

- Students born in the end of the year
  - Have better grades (p=0.0063)
  - Larger share than baseline of the Aalto population (p=0.00075)
- These results hold even after accounting for the Bonferroni correction
  - We had other statistically significant results as well, but they were rendered unsignificant after Bonferroni correction

Problems/issues with the thesis

- We only know relative age, but not absolute age
  - I.e. we assume everyone is born the same year
- Aalto population vs the Finnish baseline a faulty comparison
  - E.g. international students
- Course content differs
  - Different courses are compared whose content is vastly different
    - Hence it’s an unfair comparison to compare between different schools

Possible explanations for our results

- Students born later during the year have to work harder due to the physical differences
  - The work-ethic persists throughout life, and is more important as the physical differences diminish

Sources

- Tiiri, E. (2020) ’ Kiusaamisen ja kiusatuksi joutumisen riski on yhteydessä lapsen syntymäkuukauteen’
- Gladwell, M. ’Outliers’, Penguing books, London, (2008)
- StatFin, ’Elävät syntyneet kuukausittain’, 1900-2021 (2022)