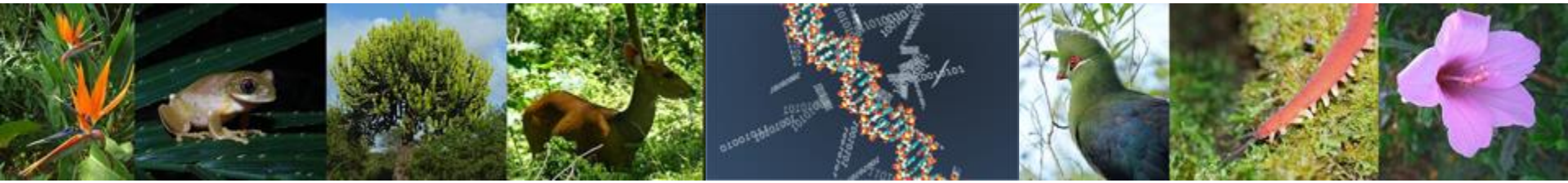
BIOS1100

Innføring i beregningsmodeller for biovitenskap



Høst 2017 – Erfaringer/evaluering

Lex Nederbragt

Studieprogram Biovitenskap

	10 sp	10 sp	10 sp
6	Valgfritt / Bacheloroppgave / Utviklingssemester		
5	Valgfritt	Spesialisering	Spesialisering
4	Ex. Phil.	Spesialisering	Spesialisering
3	Evolusjon og genetikk	Biologisk mangfold	Statistikk/matematikk
2	Fysiologi	Biokjemi	Fysikk
1	Innføring i beregningsmodeller	Celle- og molekylærbiologi	Generell kjemi

Utgangspunkt

Fokus: spennende biologiske problemstillinger

Materialet: biologiske data

Verktøyet: programmering

Motivasjon: forankring i biologi

Utgangspunkt

Fra emnebeskrivelse

Datamaskinen og programmeringsspråket Python blir brukt for å lage et virtuelt biologisk laboratorium

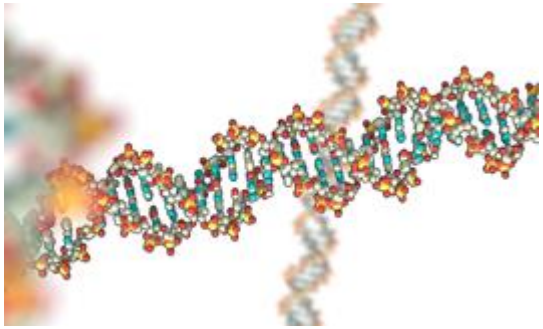
BIOS1100 første gang høsten 2017

Hvordan gikk det?

Erfaringer

Bok

Introduction to Analysis and Modeling in Biology with Python



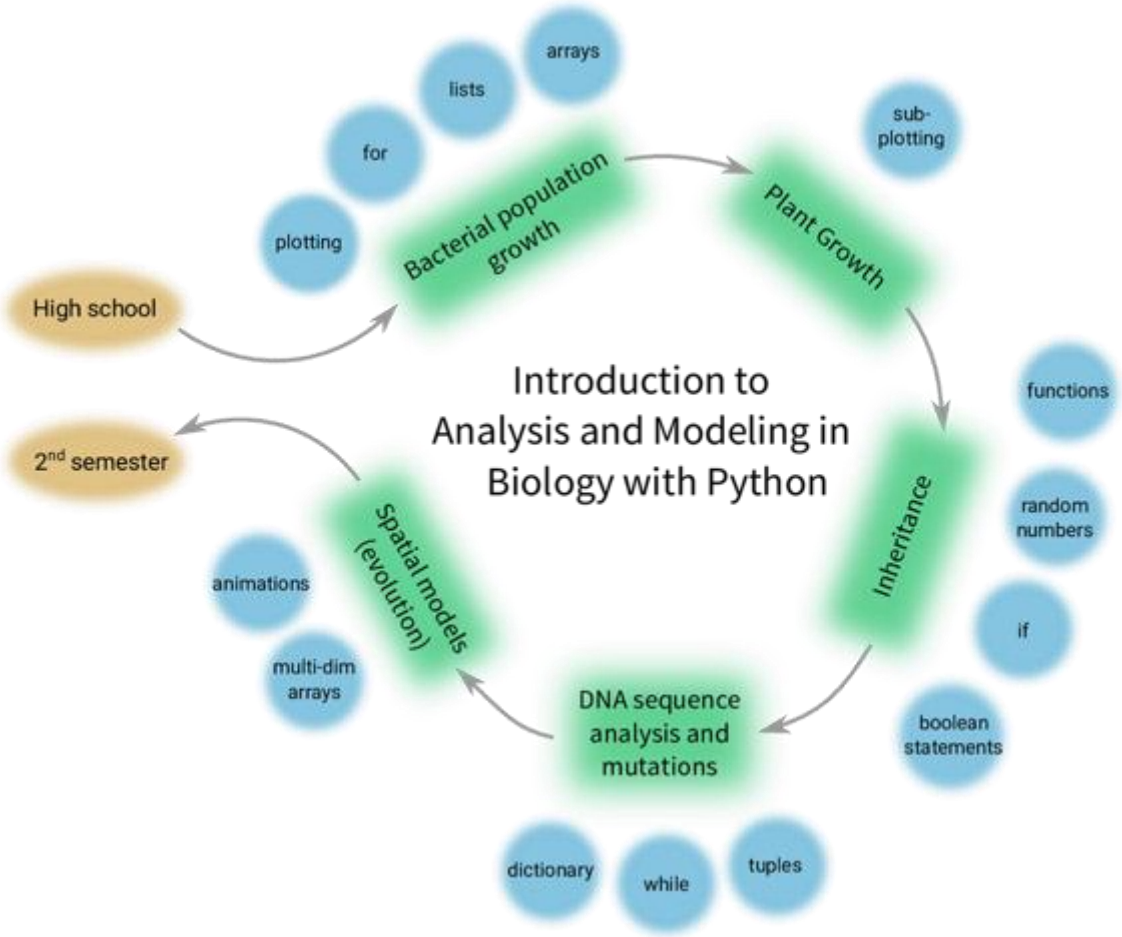
"Just in time teaching"

"Just in time preparing"

https://titan.uio.no/node/2308

Erfaringer

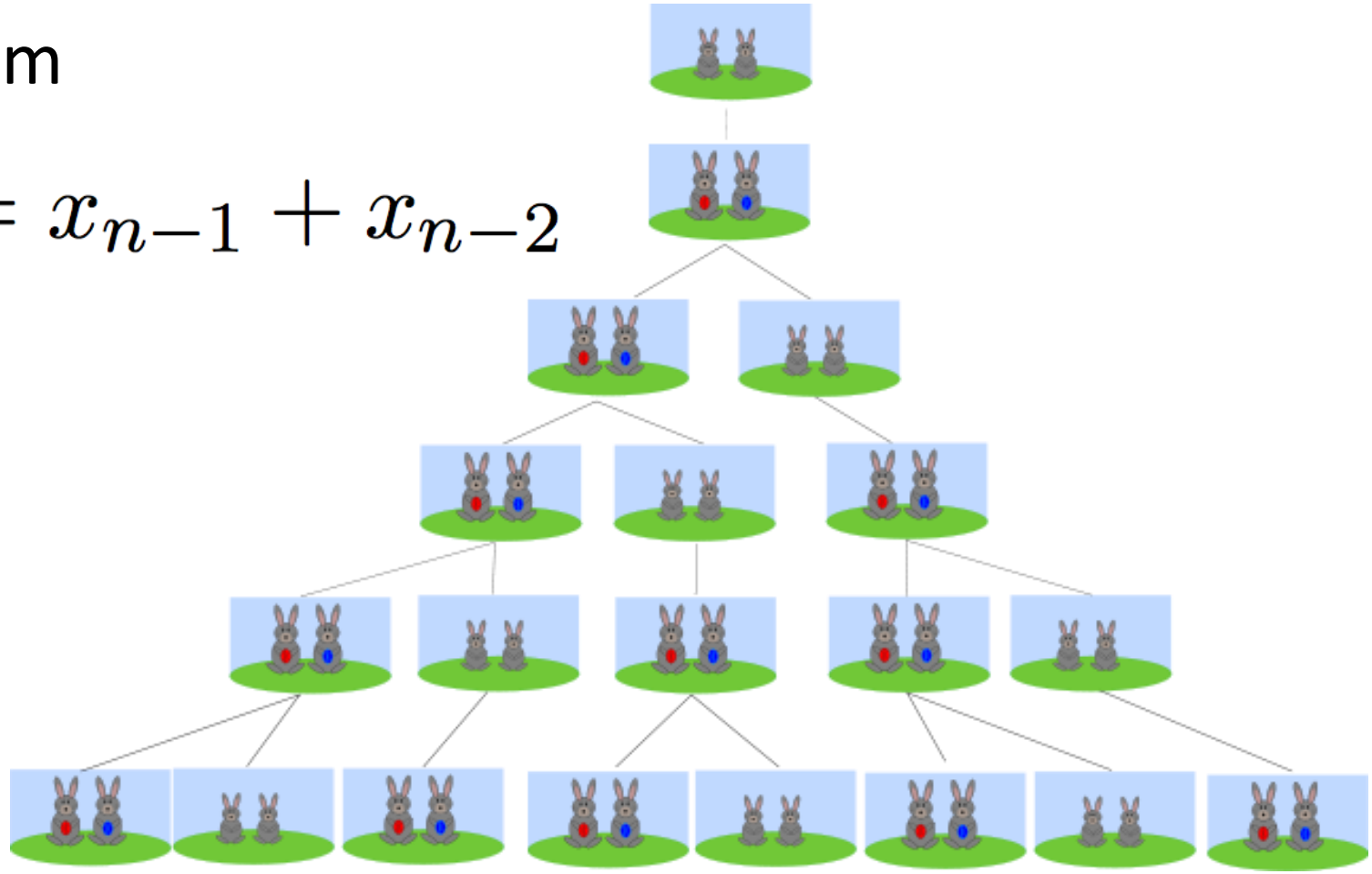
Pensum



Erfaringer

Pensum

$$x_n = x_{n-1} + x_{n-2}$$



Erfaringer

Pensum **Matematikk**

vektor- og matrisearitmetikk,

løsning av lineære likningssystemer

$$S(t+\Delta t) = S(t) - \Delta t\, \beta S(t) I(t) \quad (1)$$

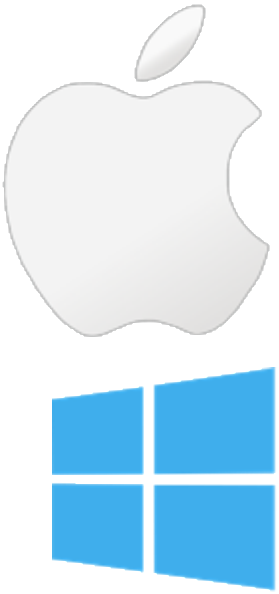
$$I(t+\Delta t) = I(t) + \Delta t\, \beta S(t) I(t) - \Delta t \nu I(t) \quad (2)$$

$$R(t+\Delta t) = R(t) + \Delta t\, \nu I(t) \quad (3)$$

http://hplgit.github.io/disease-modeling

Erfaringer

Bring-your-own-device



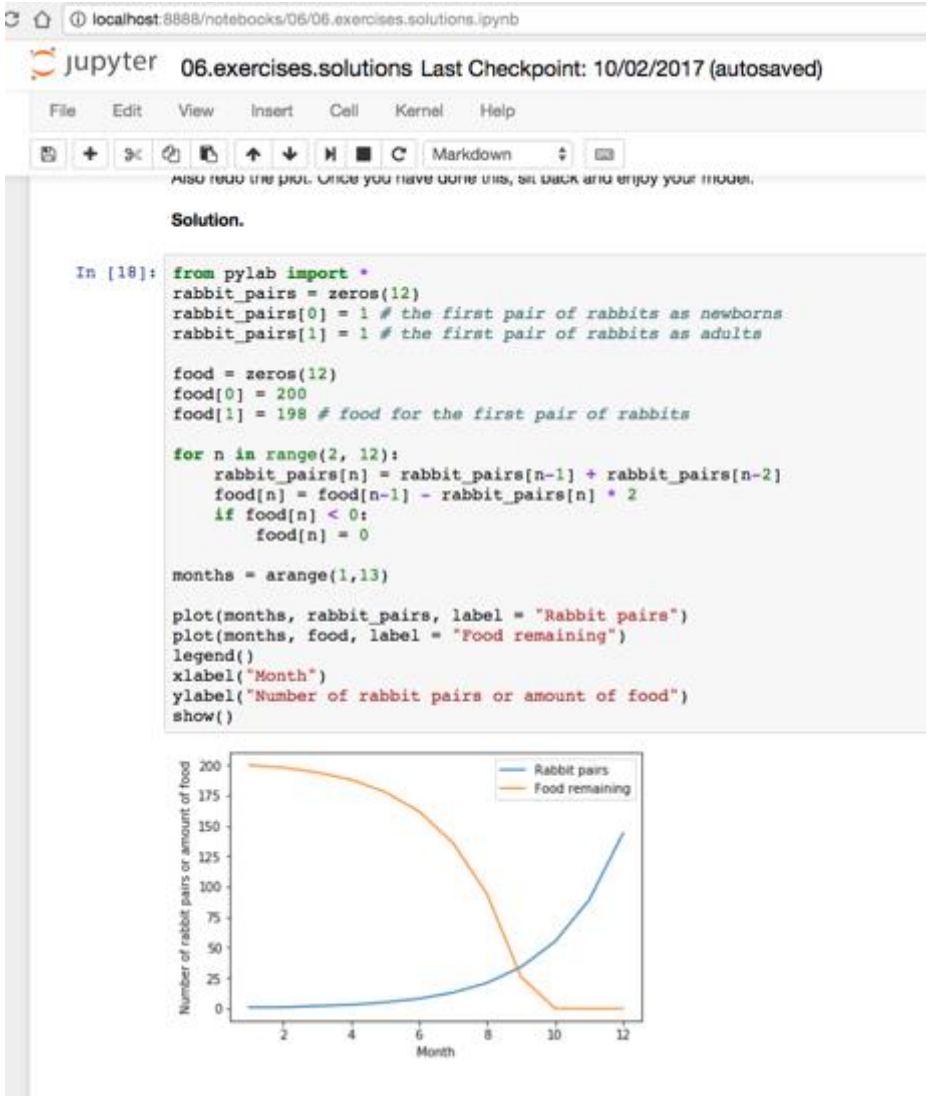
Wikimedia Commons

Erfaringer

Undervisningsrom

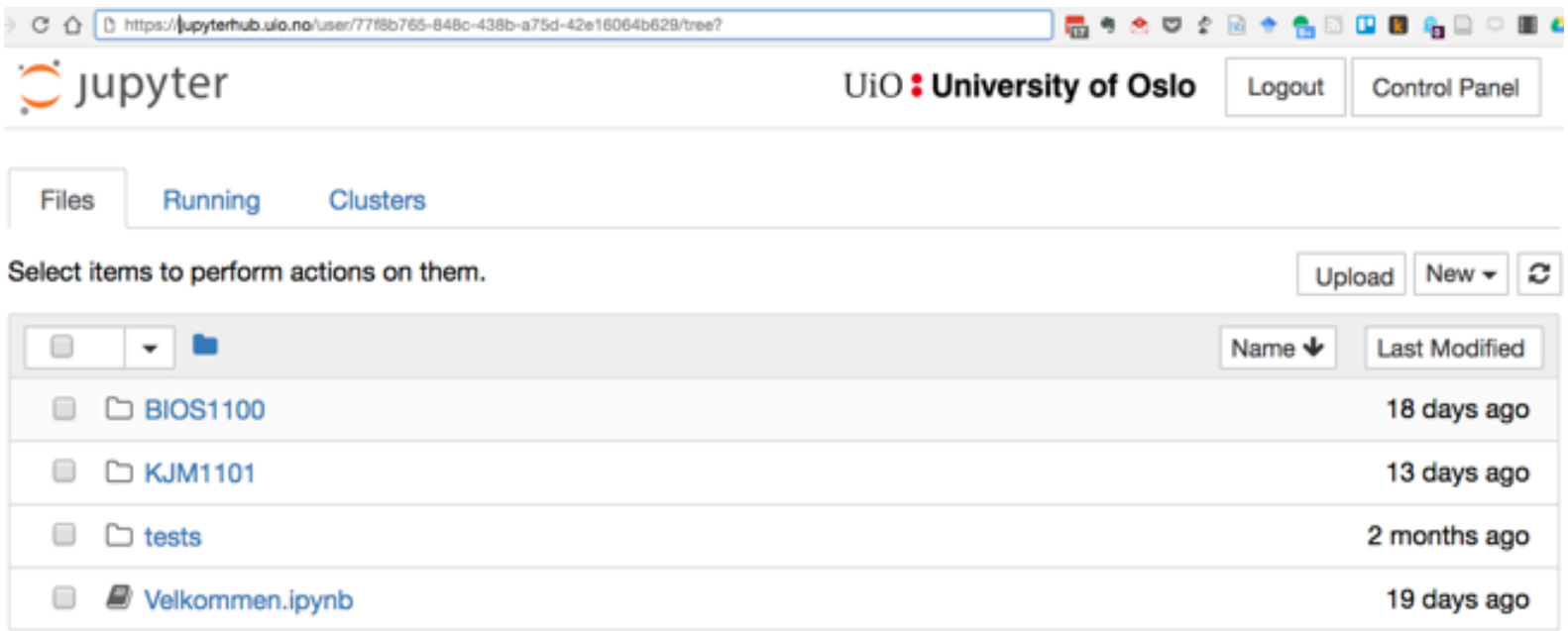
Erfaringer

Jupyter notebook



Erfaringer

JupyterHub @ UiO



Erfaringer

Lære‘bok’

PDF

By using double for loops our program becomes much more compact, and easier to extend to compare more than two generation times. The following program produce the same output as the first, but is only half the length. For a trained programmer it will also be more readable. The idea of the program is more apparent - we want to repeat the same experiment with two different sets of parameters. The repetition becomes more obvious when put inside a loop.

```
from pylab import *

N = 10
generation_time_list = [20, 40]
# Outer for loop, looping over different generation times
for generation_time in generation_time_list:
    E = zeros(N)
    t = zeros(N)
    E[0] = 10000
    # Inner for loop, looping over each generation
    for n in range(1, N):
        E[n] = 2*E[n-1]
        t[n] = t[n-1] + generation_time

    # Creating a string with the generation time to use as a label in the plot
    plot(t, E, "-o", label="generation time: " + str(generation_time) + " minutes")

yscale("log")
legend(loc="lower right")
xlabel("Time (minutes)")
ylabel("Population size")
title("Modeled bacterial growth at different temperatures")
show()
```

Let us get back to discussing the result. The graph produced by the program is shown in Figure 3.9. We see that the effect of doubling the generation time is that the growth curve becomes less steep. In fact the growth rate exactly halves. We can get this from the relation we found in Chapter 2,

$$a = \frac{\log_{10}(2)}{\text{generation time}},$$

so our model is consistent with what we observed in the data.

Revising the effect of temperature on growth rate once again. Let us end by recreating

Jupyter notebook

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In [ ]:
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$$a = \frac{\log_{10}(2)}{\text{generation time}},$$

so our model is consistent with what we observed in the data.

Revising the effect of temperature on growth rate once again

Erfaringer

Gruppelærere

Semestersamkjøring

	10 sp	10 sp	10 sp
6	Valgfritt / Bacheloroppgave / Utviklingssemester		
5	Valgfritt	Spesialisering	Spesialisering
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Erfaringer

Hva sier studentene?

“Jeg liker at [læreboken] er så knyttet til biologien, og at vi faktisk lærer biologi samtidig som programmering”

Erfaringer

Hva sier studentene?

“Jeg synes også det er veldig flott at faget er tilpasset biologi, og satt inn i en mer konkret kontekst, som gjør at man får en idé om hva det kan brukes til.

Det at oppgavene dreier seg om ting som involverer biologi gjør det også mer interessant.”

Erfaringer

Hva sier studentene?

“Jeg skjønner ingenting...”

Noe måtte gjøres…

Lex Nederbragt
@lexnederbragt

I thought @swcarpentry live-coding approach wouldn't scale to large undergrad Python course and that I could do without it. I was 2x wrong

5:09 PM - 8 Nov 2017

8 Retweets **16** Likes

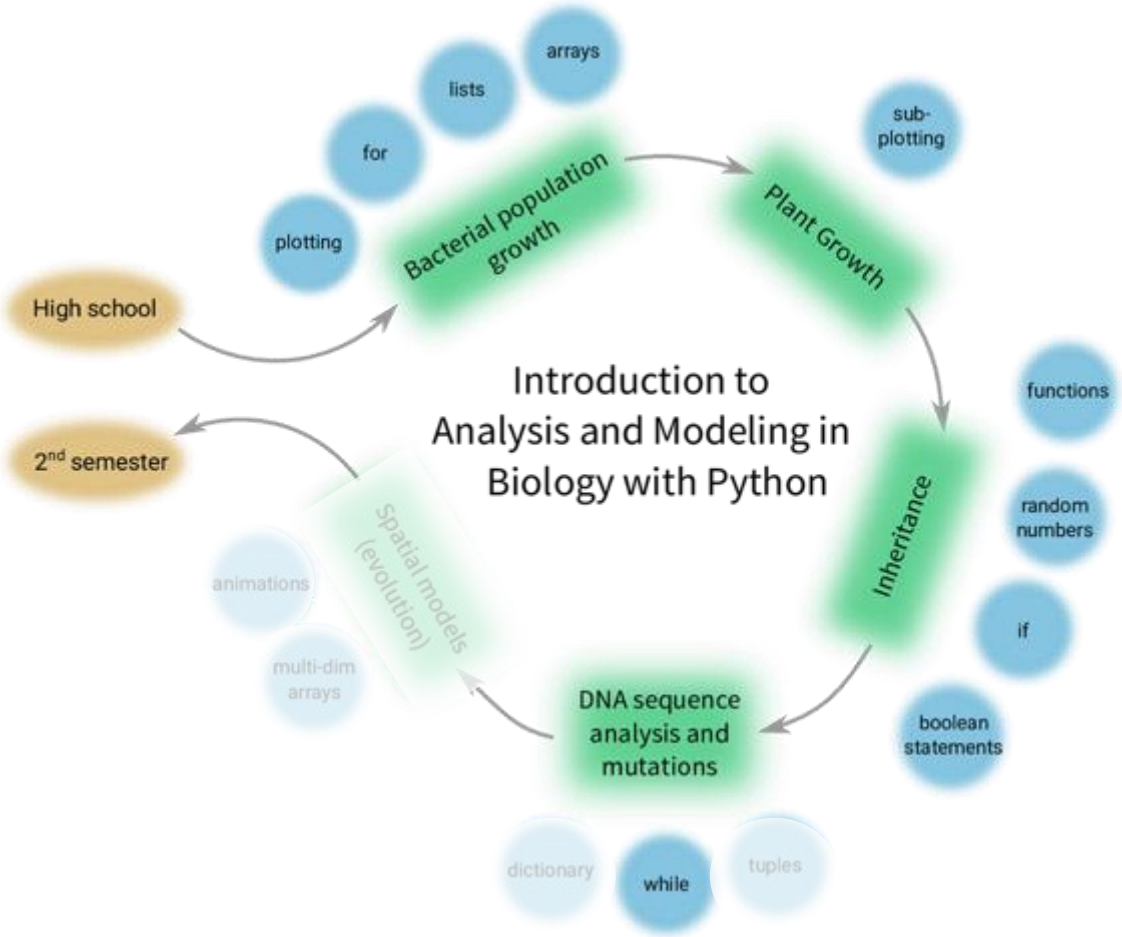
2 8 16

software carpentry

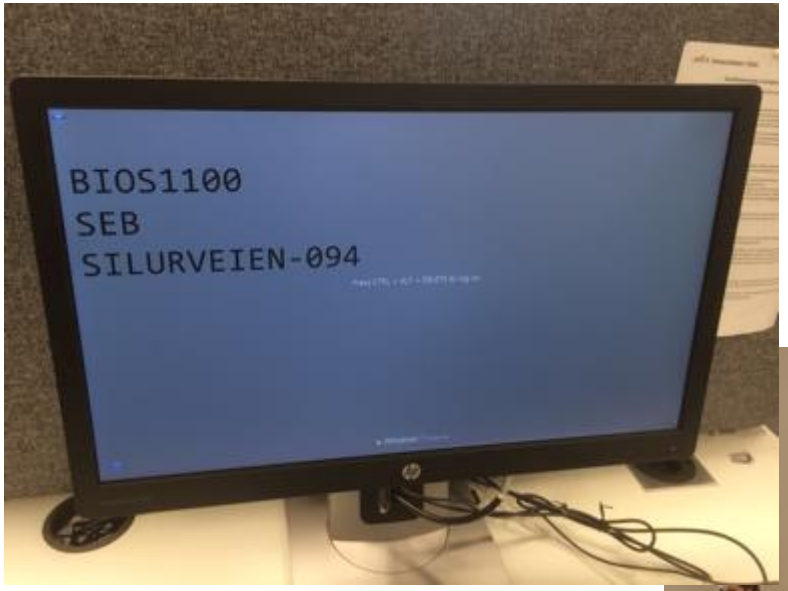
Live-"følg-med"-coding

Erfaringer

Pensum



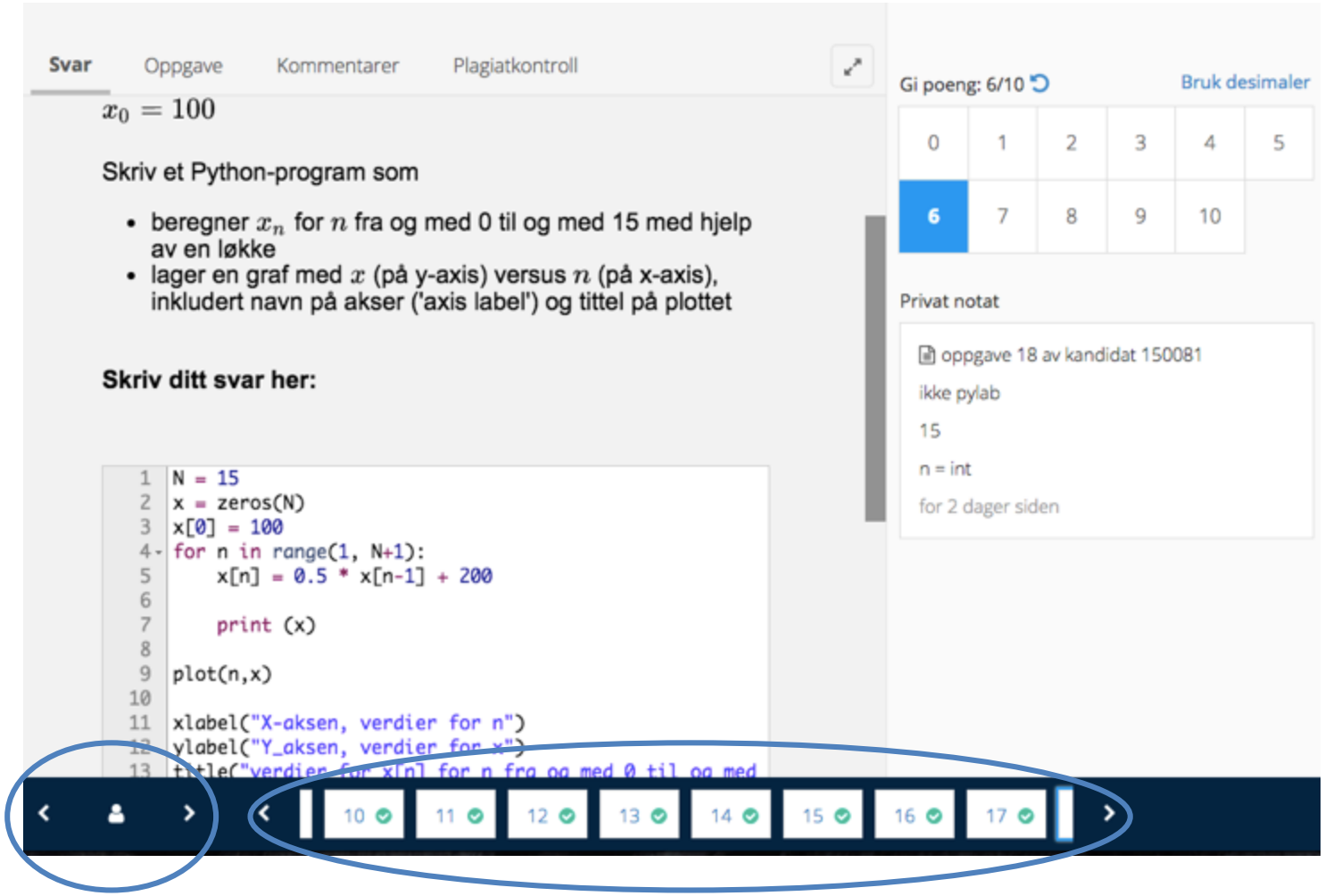
Erfaringer



Eksamen

https://titan.uio.no/node/1965

Erfaringer

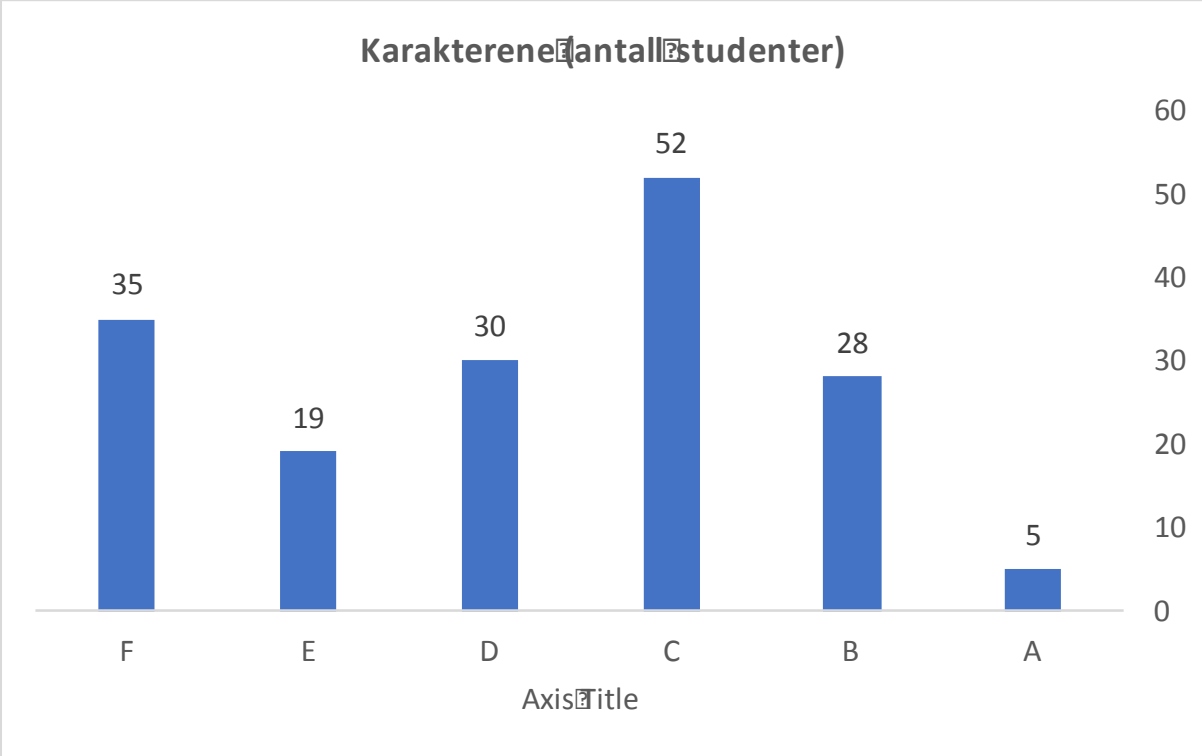


Horizontal retting

Vertikal retting

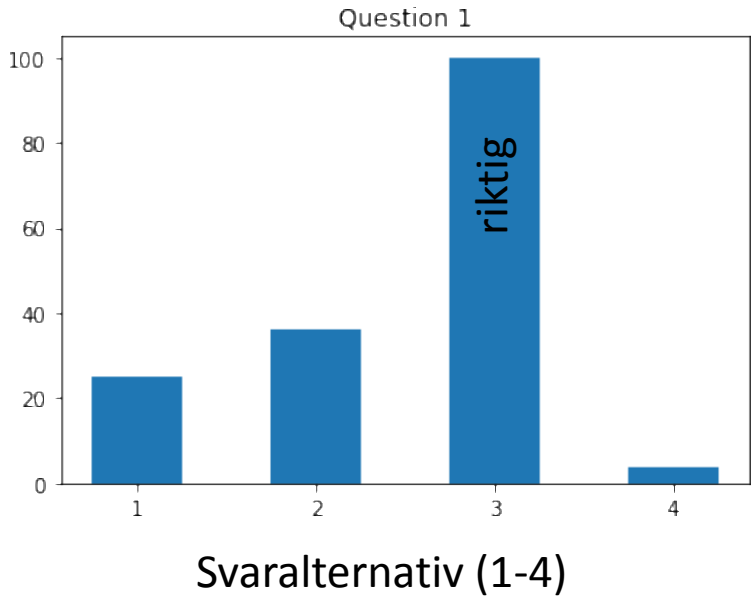
Eksamen

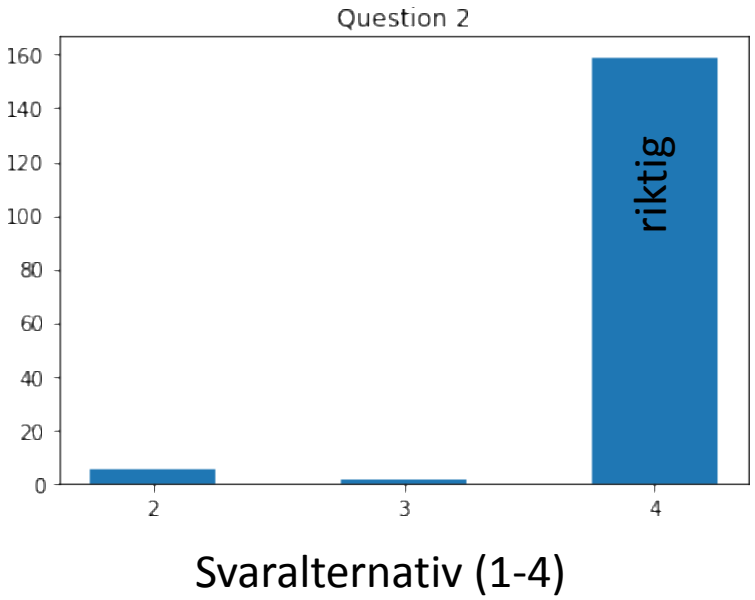
Studenter	200
Eksamensklar	183
Leverte	169
Strøk	35 (21%)



Inspera ‘Data Mining’

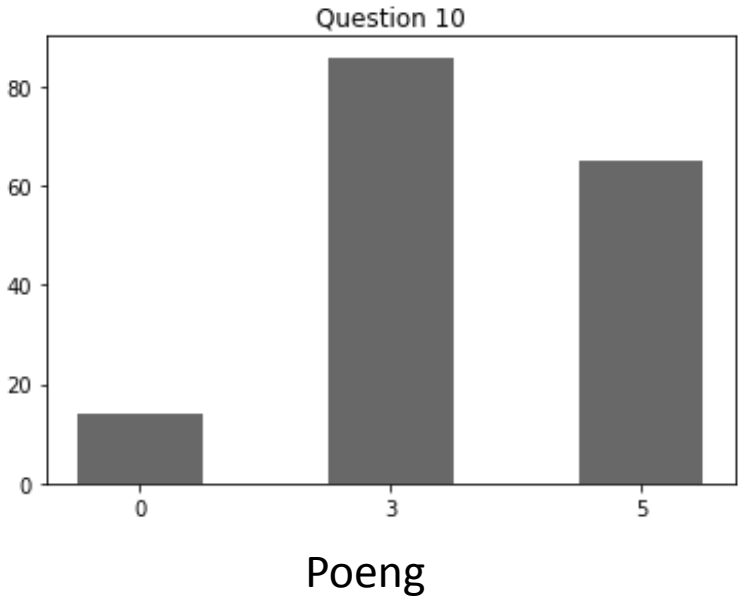
Flervalgsoppgaver

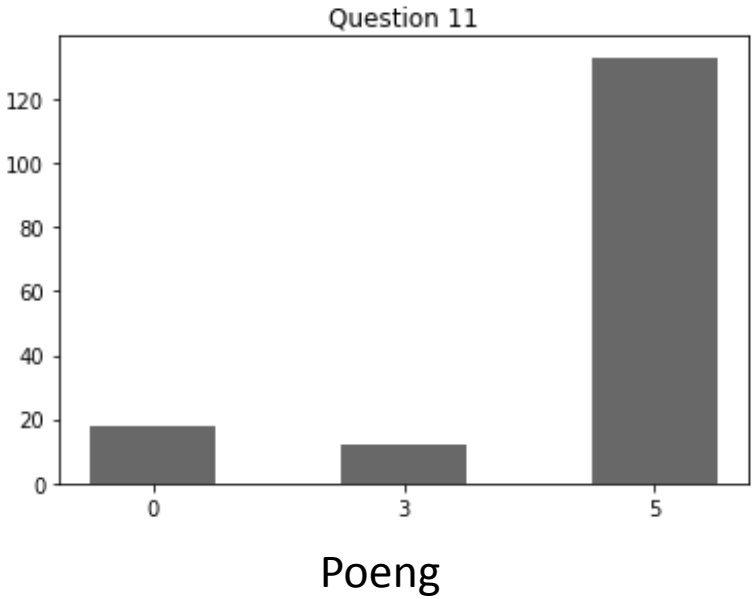




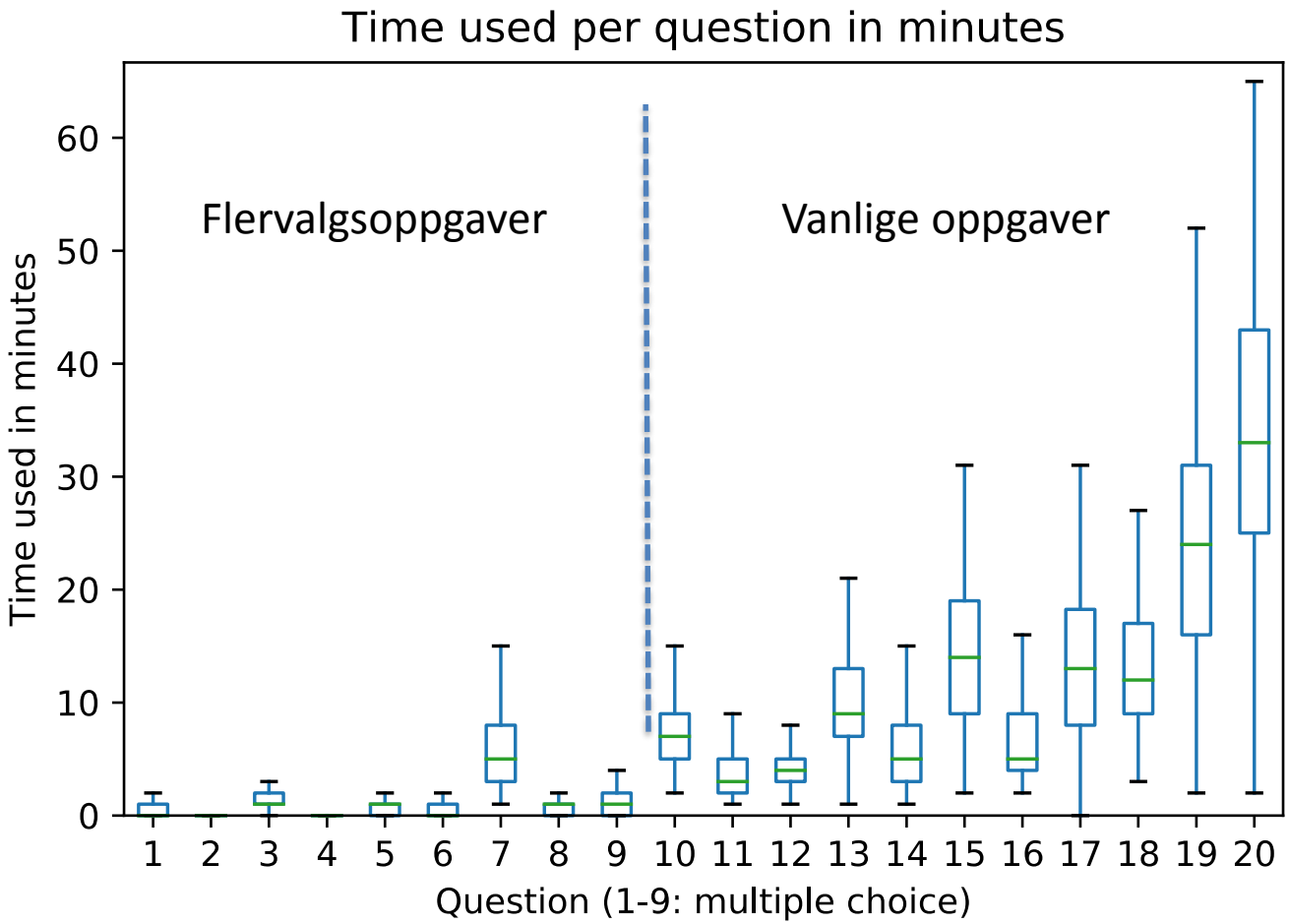
Inspera ‘Data Mining’

Vanlige oppgaver





Inspera ‘Data Mining’



Konklusjon

Vi har gjort det!

Konklusjon

Besøk

http://www.uniforum.uio.no/nyheter/2017/10/henrik-asheim-blei-begreistra-for-forsking-og-unde.html
http://www.uniforum.uio.no/nyheter/2017/11/programmering-for-ferske-biologistudenter.html

Aftenposten, 8. januar 2018

Aftenposten A-magasinet Osloby Sport Meninger Lex Meny

NHO bommer om koding i skolen | Torstein Tvedt Solberg

TORSTEIN TVEDT SOLBERG STORTINGSREPRESENTANT, ARBEIDERPARTIET , UTDANNINGSKOMITEEN

OPPDATERT: 09.JAN.2018 09:41 | PUBLISERT: 08.JAN.2018 18:15

Torstein Tvedt Solberg.
Peter Mydske

Koding og dataprogrammering er som et språk. Det krever en grunnleggende forståelse, og læren om den må inn i skolen. Men skiller man det ut som et eget fag, mister man det viktigste, for koding er et verktøy som må brukes i flere fag.

Universitetet i Oslo (UiO) har forstått dette og gir nå biologistudenter kodekurs, slik at de selv kan programmere for å løse rapportering og matteformler raskere.

Veien videre

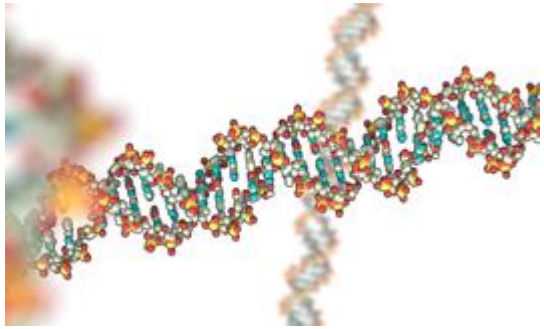
Veien videre for BIOS1100

Live-coding fra første uke

Veien videre for BIOS1100

Publisere pensumboken

Introduction to Analysis and Modeling
in Biology with Python



Veien videre for BIOS1100

In-time preparation

https://pixabay.com/p-1673577

Veien videre for BIOS1100

Mer fokus på matte & modellering

$$P_n = g_n w S P_{n-1} + g_n w (1 - g_{n-1}) w S P_{n-2}$$

https://pixabay.com/p-1673577

Veien videre for BIOS1100

Vi skal gjore det enda bedre!

BIOS1100 - Innføring i beregningsmodeller for biovitenskap

Semesterside for BIOS1100 - Høst 201~~7~~ 8

Timeplan

Eksamen: Tid og sted

Pensum/læringskrav

Kontakt

Institutt for biovitenskap

Faglærere

- Lex Nederbragt
- NN...

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