IN[34]120 Søketeknologi

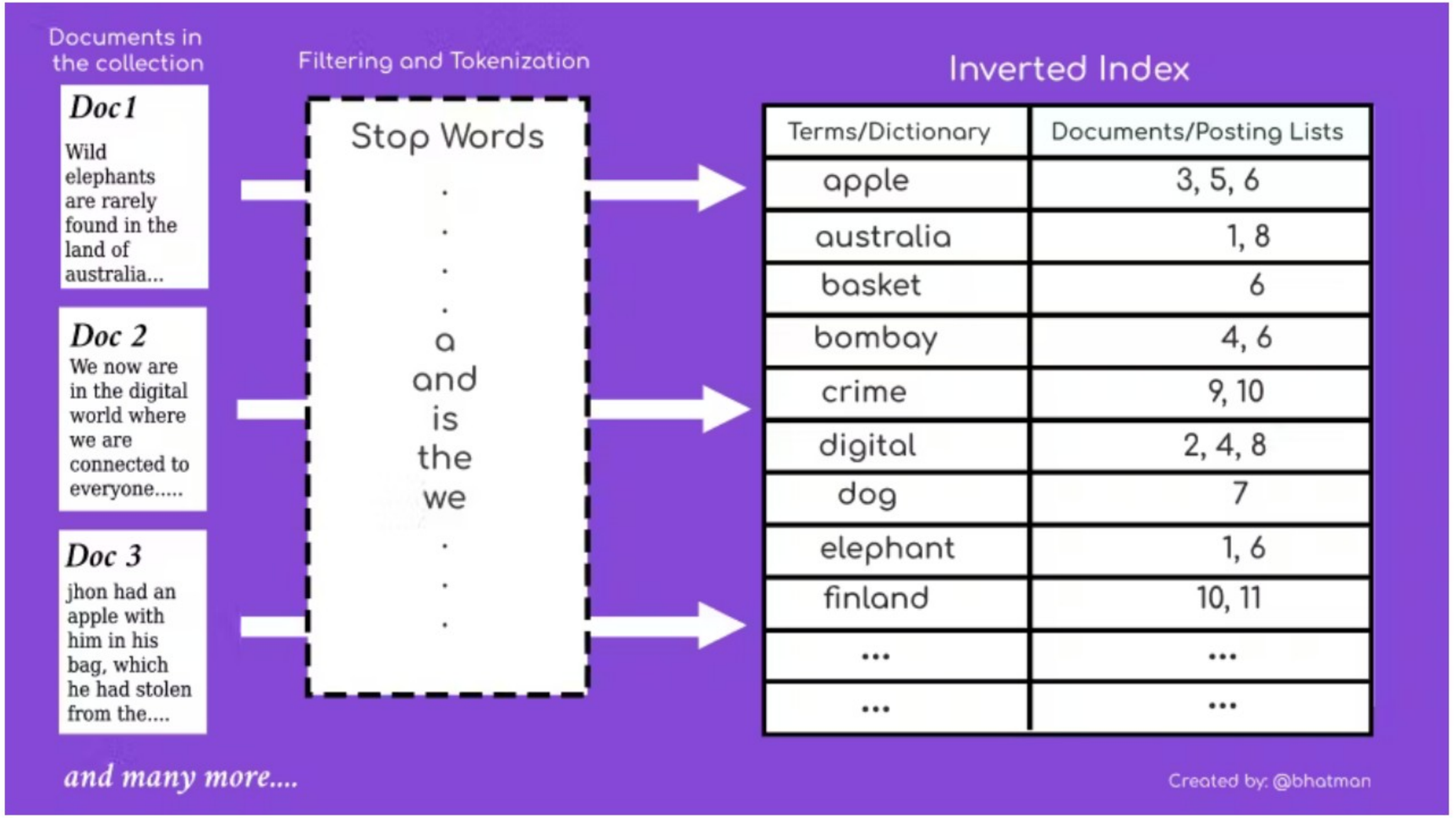
Uke 3: **Algoritmer for strengesøk**

2024-09-10 14:15 @ Chill

Gruppelærer: Oliver, oliverrj@ifi.uio.no

Agenda:

- Bruk av datastrukturer fra forrige uke
- Introdusere oblig B (frist 27.09)
- Oblighjelp A (frist på fredag, 13.09)



Husk: inverted index m/posting lists

Rep: Inverted index

- Mapping: term -> posting list
- Som registeret i ei bok

Rep: Posting list

- En mengde dokumenter
- Alle dokumentene inneholder minst ett ord som er likt
- "her er alle dokumentene med 'Zeus'"
- Én PL pr unike term

Lecture recap

Altså fra i går, 2024-09-09

Husker noen noe??

Ting som ble husket fra forelesningen. Gjerne stikkord:

Status for oblig A (frist på fredag)

Jeg er ferdig

Jeg stresser med obligen

Jeg har troa på at dgb

Strongly disagree

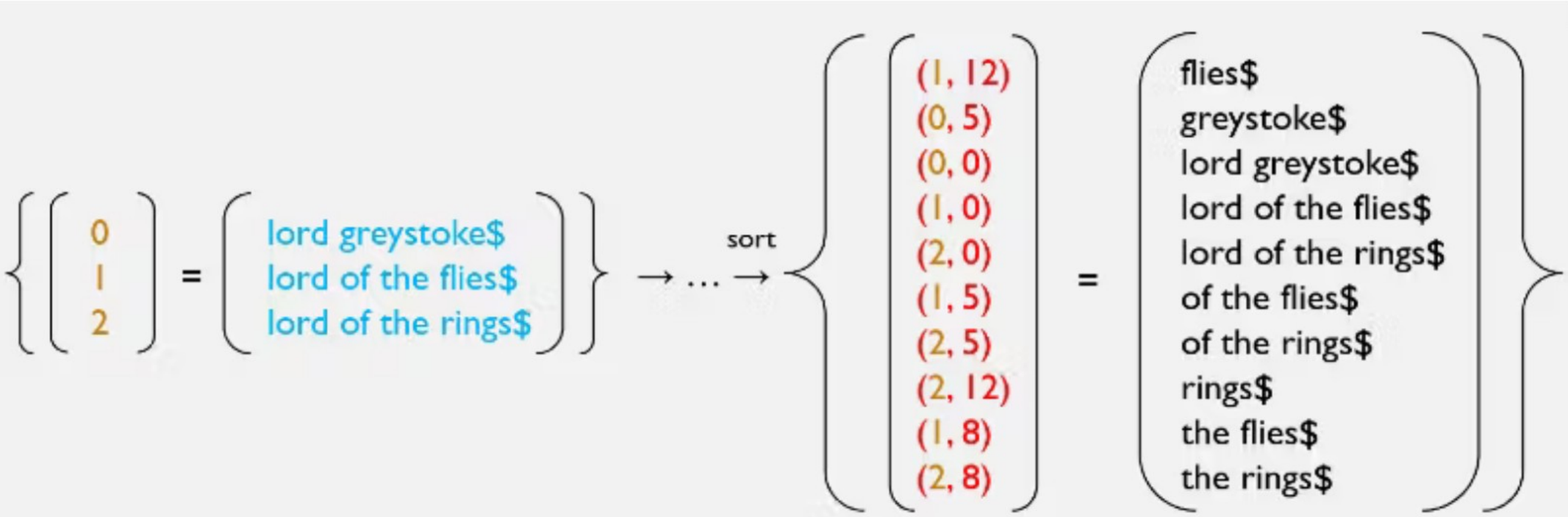
Strongly agree

Suffix arrays

- Data structure for search
- Find matching terms from suffixes
- Sorted lexigraphically - why?

"LOG ER KOSELIG" ~ØHRN, 2024-09-02

Hvorfor sorterer man suffixes alfabetisk?



The application dictates what we consider to be a searchable suffix, i.e., where matches can begin and end

Suffix Array Example

Given String: banana

Suffixes		Sorted Suffixes
0 banana		5 a
1 anana	Sort the Suffixes	3 ana
2 nana	---------->	1 anana
3 ana	alphabetically	0 banana
4 na		4 na
5 a		2 nana

Suffix array: {5, 3, 1, 0, 4, 2}

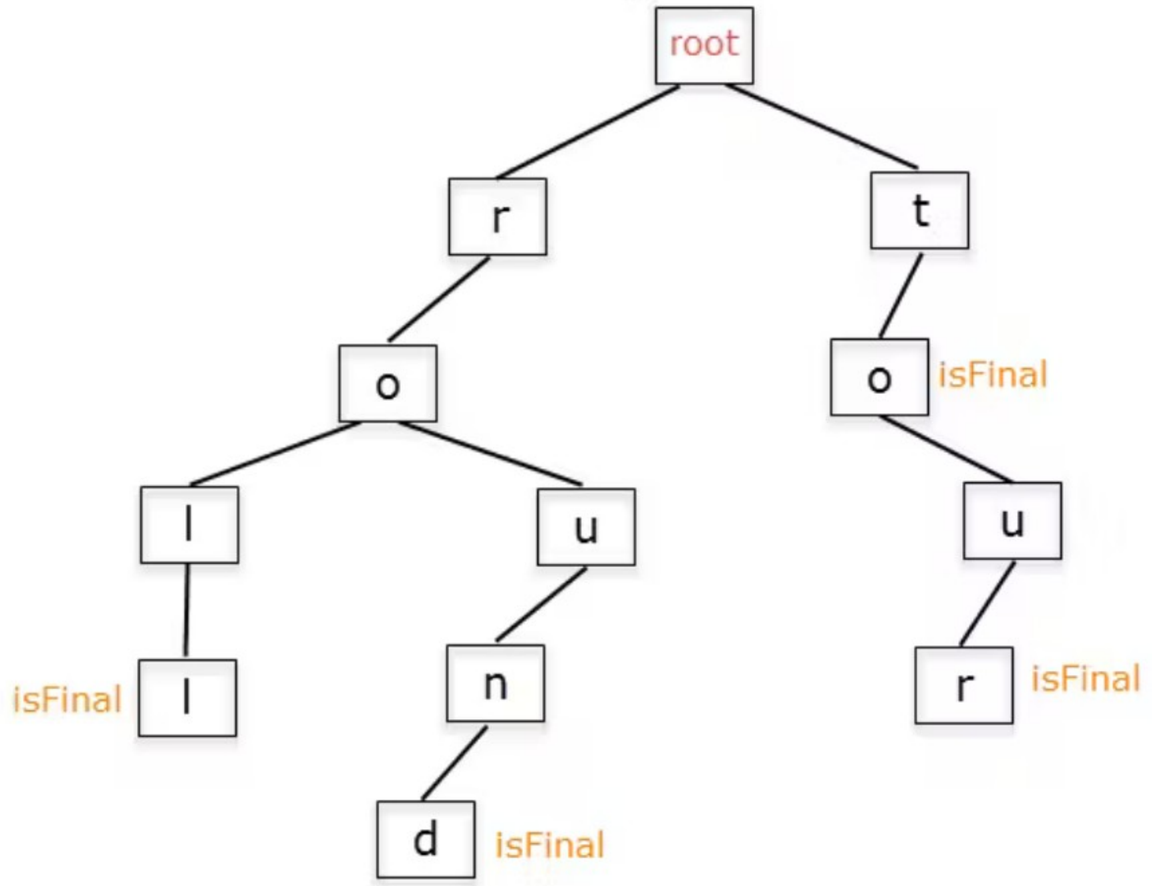
Visualisering av suffix et basic suffix array (Oblig B)

NB: oblig B-1: Token boundries

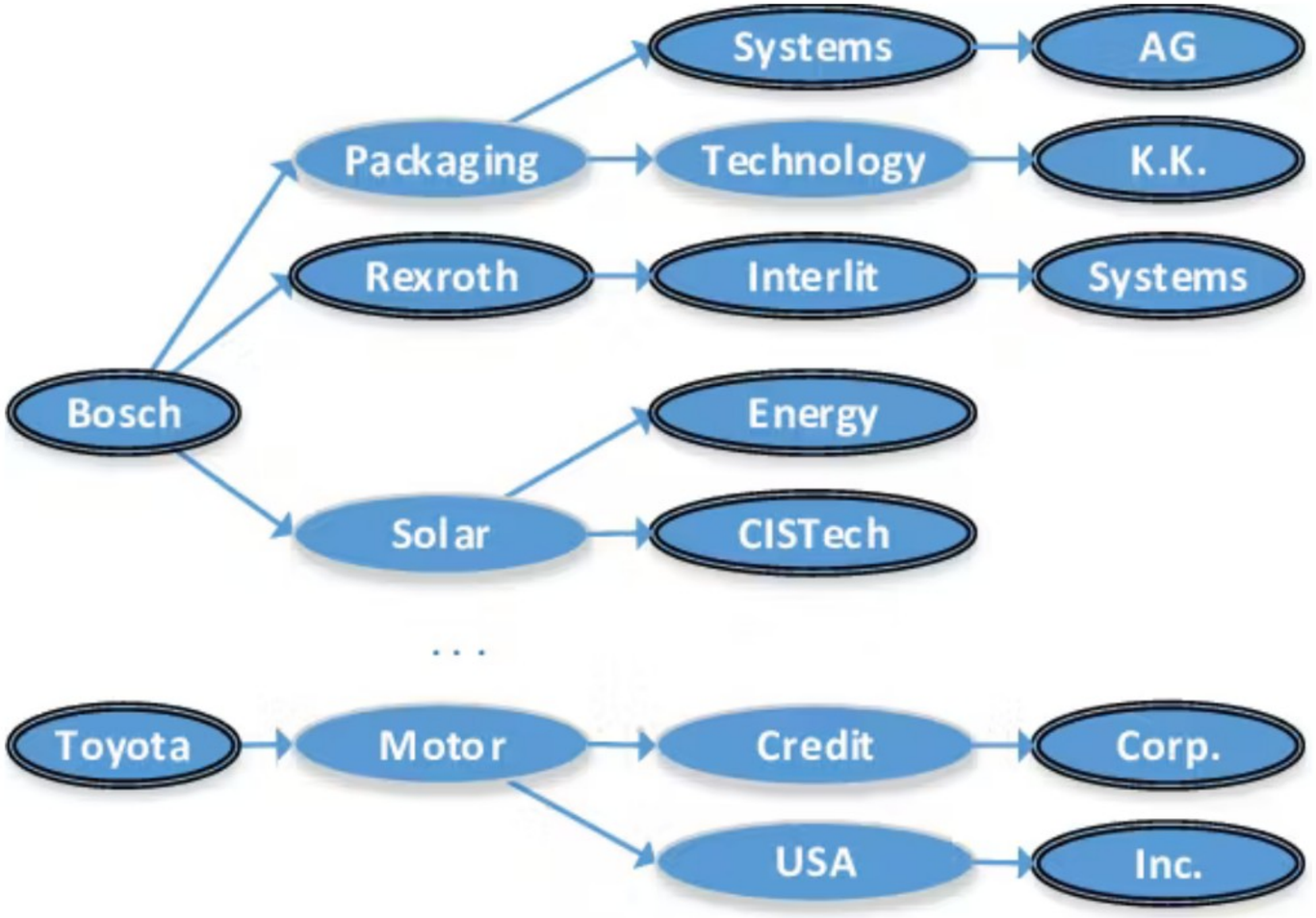
- Ett suffix for hvert token
- Ikke ett suffix for hvert tegn
- Prekoden sin tokeniser har en metode ranges()

Tries

- Data structure - prefix tree
- Finn ut om en streng inngår i et korpus (raskt)
- Oblig B



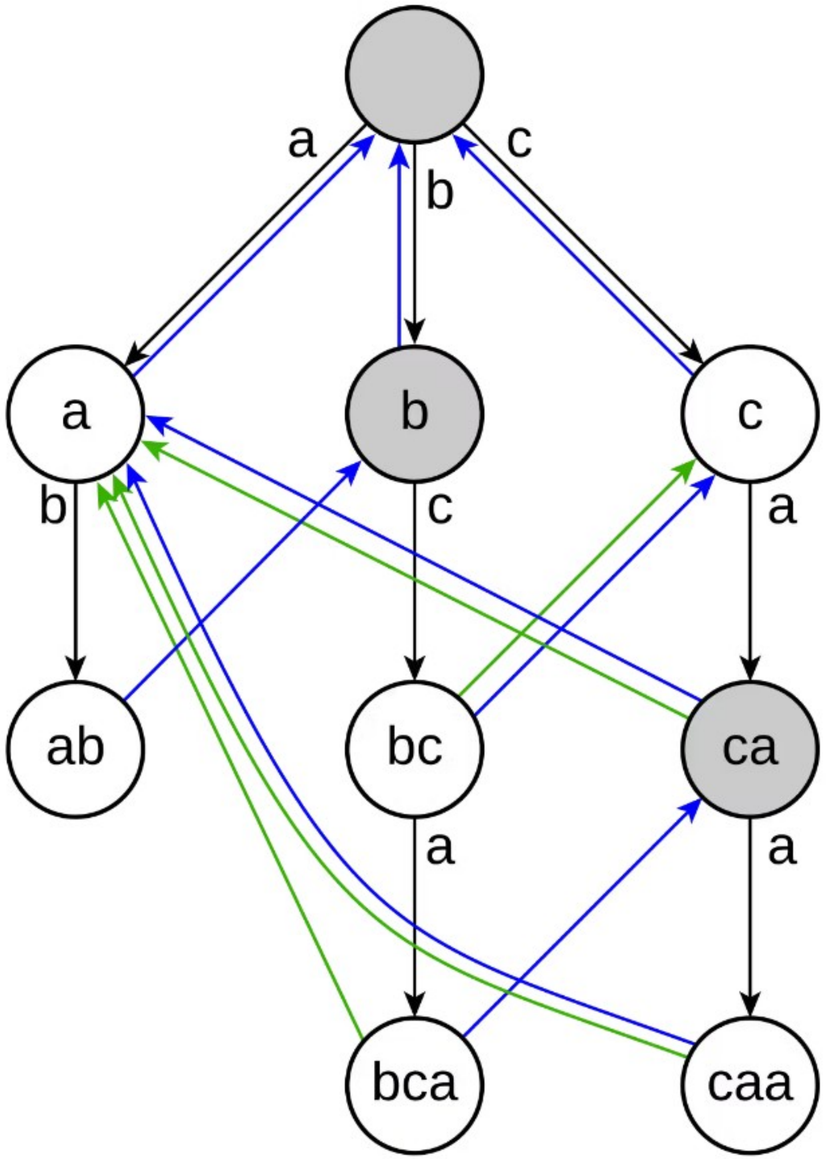
Visualisering av trie



Sauce:
https://www.researchgate.net/publication/318394164_Improving_Company_Recognition_from_Unstructured_Text_by_using_Dictionaries

Aho-Corasick-algoritmen (*trie search*)

- Ha en liste med states
- Beveg deg ned i trien
- Se om du kommer frem til en final node
- NB: Forenklet versjon



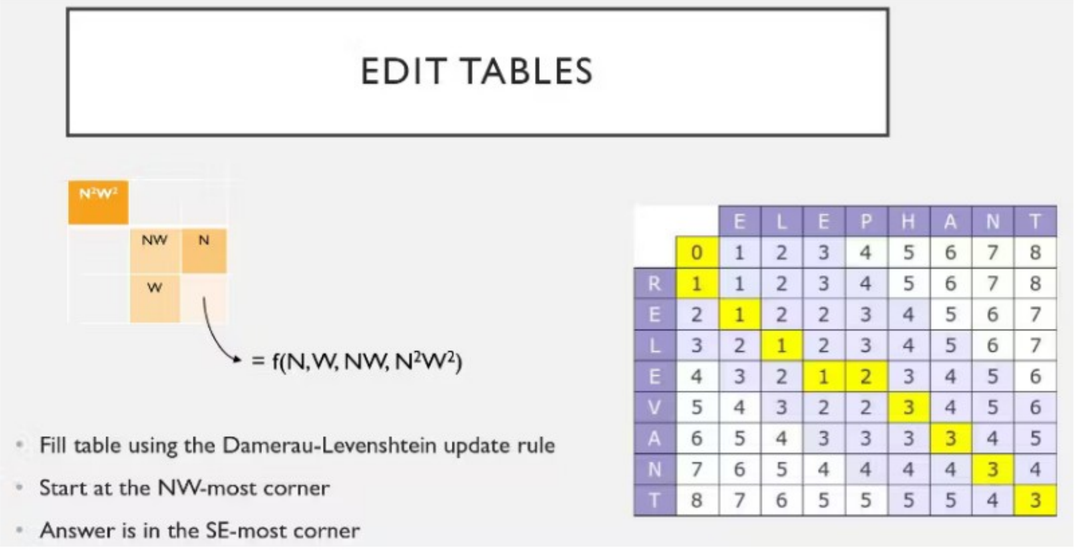
Edit distance

- Metrikk: Hvor like er 2 strenger

		E	L	E	P	H	A	N	T
	0	1	2	3	4	5	6	7	8
R	1	1	2	3	4	5	6	7	8
E	2	1	2	2	3	4	5	6	7
L	3	2	1	2	3	4	5	6	7
E	4	3	2	1	2	3	4	5	6
V	5	4	3	2	2	3	4	5	6
A	6	5	4	3	3	3	3	4	5
N	7	6	5	4	4	4	4	3	4
T	8	7	6	5	5	5	5	4	3

Edit tables

- Regne ut edit distance mellom 2 strenger
- Hopper alltid 1 hakk (hvorfor?)
- Kommer typisk på eksamen, f.x. "*hva er feil i denne tabellen?*"



		E	L	E	P	H	A	N	T
	0	1	2	3	4	5	6	7	8
R	1	1	2	3	4	5	6	7	8
E	2	1	2	2	3	4	5	6	7
L	3	2	1	2	3	4	5	6	7
E	4	3	2	1	2	3	4	5	6
V	5	4	3	2	2	3	4	5	6
A	6	5	4	3	3	3	3	4	5
N	7	6	5	4	4	4	4	3	4
T	8	7	6	5	5	5	5	4	3

Oblig B

Frist: 2024-09-27

B-1 eller B-2.
Man velger hvem av dem man gjør.

Kan gjøre begge for gøy...

Oblig B-1

- → Suffix array
- → Trie search
- → Får ferdig trie fra prekoden

Assignment B-1

Deadline: 2024-09-27

The purpose of this assignment is twofold:

- Build a simple suffix array and implement "phrase prefix searches" using this. For example, for a supplied query phrase like *to the be*, we'd return documents that contain phrases like *to the bearnaise*, *to the best*, *to the behemoth*, and so on. I.e., we require that the query phrase starts on a token boundary in the document, but it doesn't necessarily have to end on one.
- Given a trie ("dictionary") with a potentially very large number of entries (words and phrases of arbitrary length), implement a simple version of the Aho-Corasick algorithm that efficiently detects the subset of dictionary entries that also occur within a given text buffer. For example, if the dictionary contains *harry potter* and *wizard*, we'd efficiently detect the presence of these strings within the buffer *a wizard named harry potter*. Detected entries should start and end on token boundaries. If entries overlap in the document then all matches should be reported.

Your solution should only contain edits to the files `suffixarray.py` and `stringfinder.py`. Changes to other files will be ignored.

Oblig B-2

- → Approximate string matching
- → = Trie search m/edit distance
- → Basically Shang+Merretts paper

Assignment B-2

Deadline: 2024-09-27

The purpose of this assignment is to implement the core idea outlined in the paper by Shang and Merrett, that shows how to reasonably efficiently compute the bounded edit distance between a query string and a large collection of candidate strings. The collection of candidate strings are represented in a trie. For example, for the query *banana* I should get back the *n* strings in my string collection that have the smallest edit distance to *banana*. We can bound the edit distance, so that we only report matches that are less than or equal to *k* edits away from the query string. Imposing such an upper bound allows us to prune down the search space and evaluate far fewer candidates than otherwise needed.

To achieve this your task is twofold:

- Implement the required edit table logic required to compute Damerau-Levenshtein distance, and equip the edit table with an interface suitable to be used together with a trie search as described in the paper by Shang and Merrett. I.e., your implemenation should be able to correctly compute both the edit distance between two arbitrary, known strings of reasonable length, as well as enable a column-by-column computation driven by a search procedure external to the table.
- Implement an efficient search procedure over the trie, that uses your edit table implementation. I.e., branches in your trie that correspond to an edit distance larger than *k* from the query should not be visited and evaluated.

Your solution should only contain edits to the files `edittable.py` and `editsearchengine.py`. Changes to other files will be ignored.

Vise oblig-prekode?

Peke på relevante metoder osv

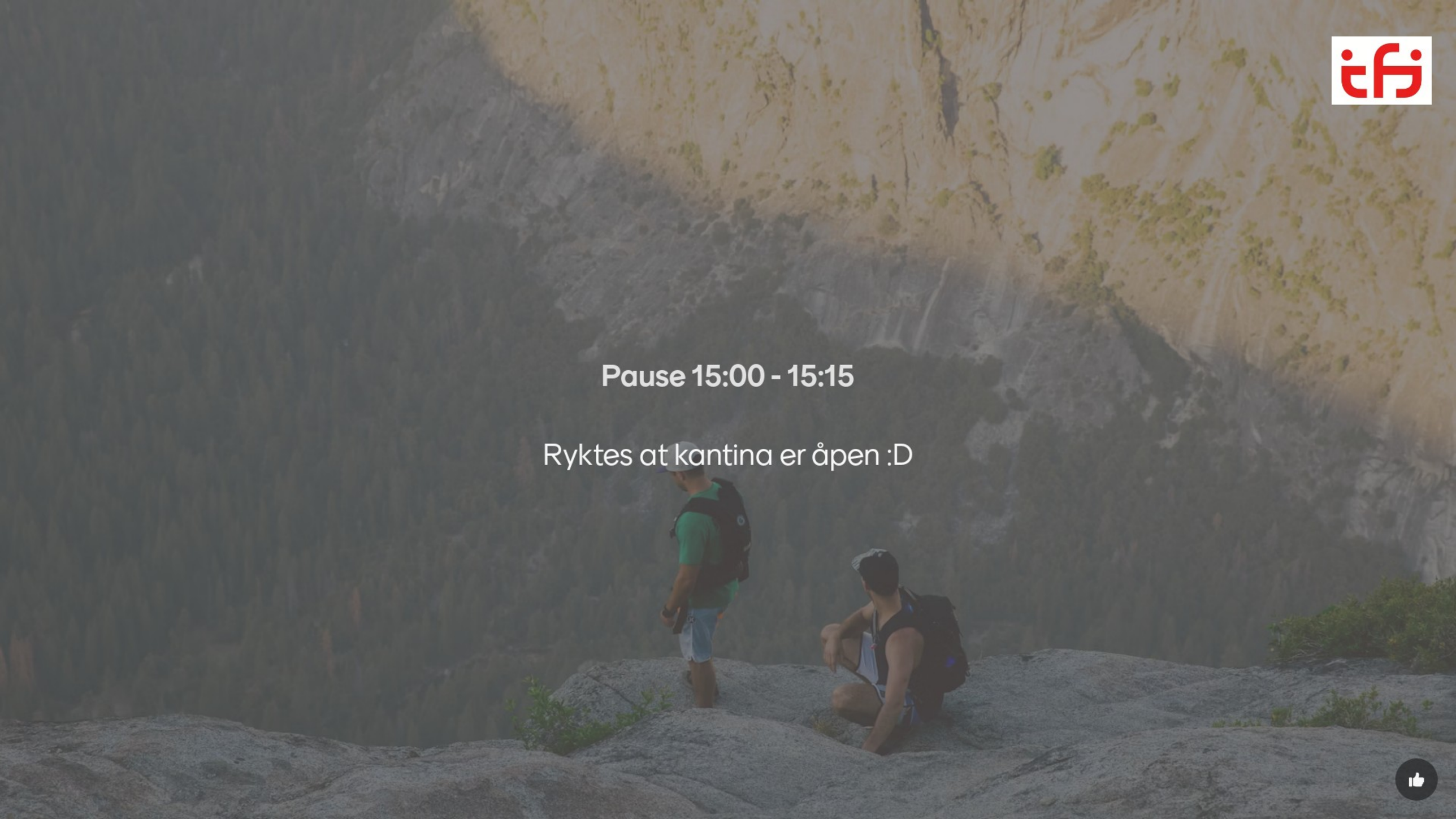
Spørsmål? 

Resten av tiden (til 16): Oblighjelp

Neste gang:

index construction + compression?

Spørsmål? Mattermost, mail, brevdue: oliverrj@ifi.uio.no


Pause 15:00 - 15:15
Ryktes at kantina er åpen :D