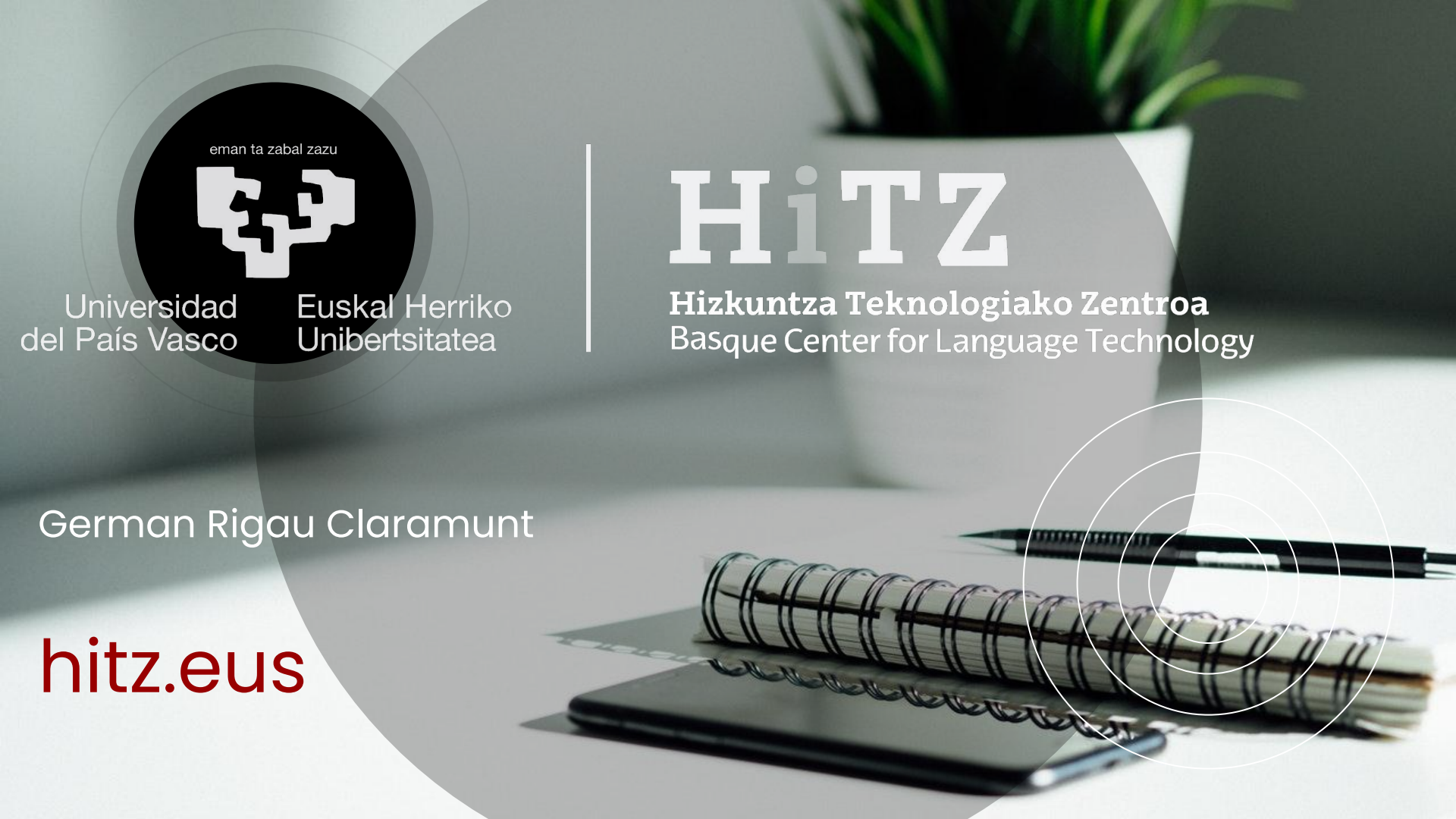
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Facing NLP

Facing NLP

- From Cyc (adapted) (I)
    - Fred saw the plane flying over Zurich.

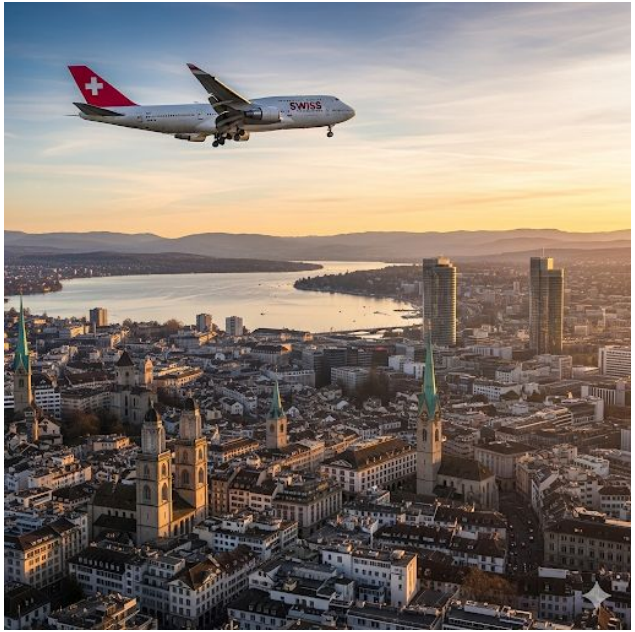
Facing NLP

- From Cyc (adapted) (II)
    - Fred saw the train flying over Zurich.

Facing NLP

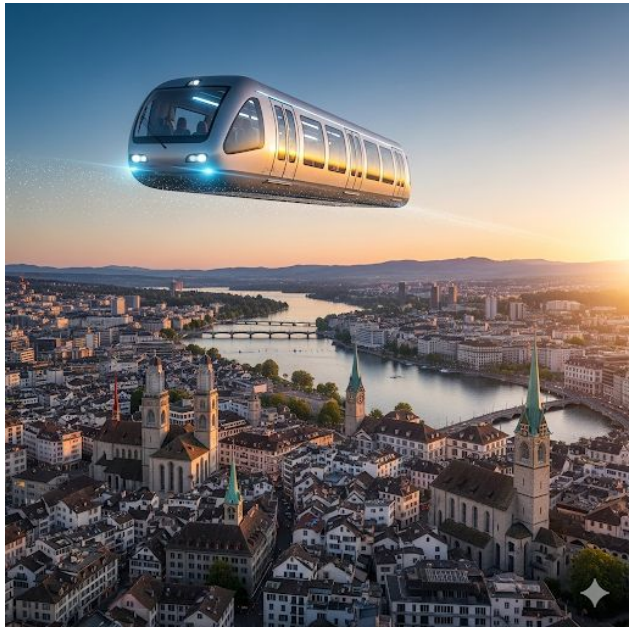
- From Cyc (adapted) (III)
  - Fred saw the plane flying over Zurich.
  - Fred saw the train flying over Zurich.

Facing NLP



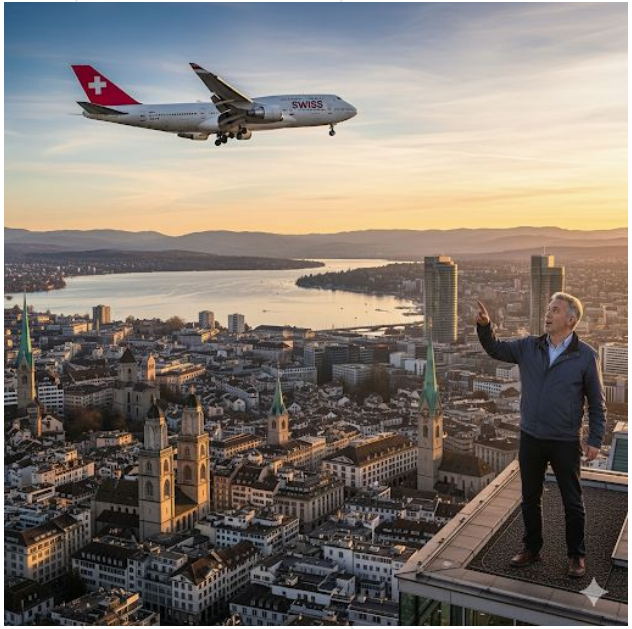
Fred saw a **plane** flying over Zurich.

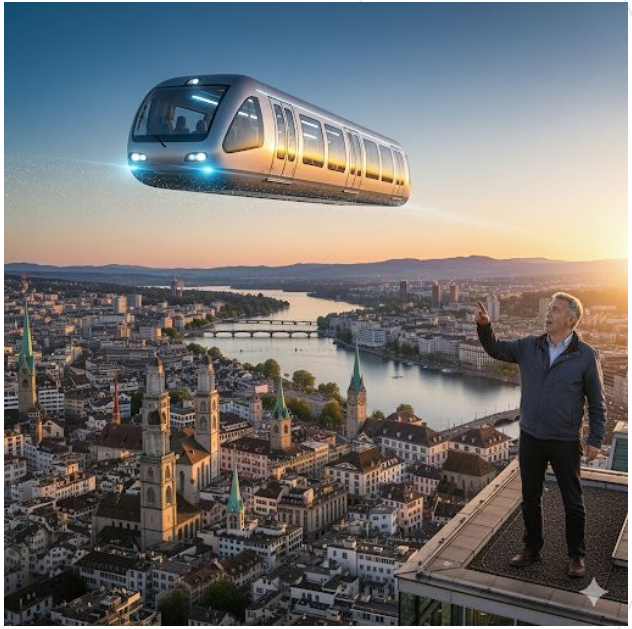
Facing NLP



Fred saw a **train** flying over Zurich.

Facing NLP





Fred saw a **plane/train** flying over Zurich.

Facing NLP

- From Winograd Schema Challenge (I):
    - The trophy would not fit in the brown suitcase because it was too big (small). What was too big (small)?
    - Answer 0: the trophy
    - Answer 1: the suitcase

Facing NLP

- From Winograd Schema Challenge (II):
    - The bee landed on the flower because **it** had pollen.
    - The bee landed on the flower because **it** wanted pollen.

Facing NLP

- Setting
    - Difficulty of NLP
    - Levels of NLP processing
    - Research areas related to NLP

Facing NLP

- Difficulty of NLP
  - Language is dynamic!
  - More than 5000 languages!
  - … and ~6000 millions of people!
  - Complexity: several and complex levels of processing
  - Ambiguity!
  - Incomplete knowledge, fuzy, …
  - Requires World Knowledge!
  - Within a social interaction system!

Facing NLP

- Levels of NLP processing (I)
  - Phonetic: relating sounds with words
  - Morphologic: building words: puño, empuñar, …
  - Syntactic: building sentences with words and the role they play:
    - *E.on will buy Endesa / Endesa will be acquired by por E.on*
  - Semantic: denoting meaning from words and sentences
    - *Zapatos de piel de señora / Lady leather shoes*
  - Pragmatic: … in a context
    - *Me dás hora? Tienes hora?* … in the street / in the dentist

Facing NLP

- Levels of NLP processing (II)
  - Discourse:
    - *Él le dijo después que lo pusiera encima.*
  - World knowledge: how to manage (and acquire)
    - *Lucy in the sky with diamonds*
    - *Clever & Smart*
    - *GM drives to make Saturn a star again*
    - *They are to see you better- said the wolf imitating the grandmother's voice.*
  - Generation: how to generate correct text/sounds
    - *16/02/2007 => dieciséis de febrero del dos mil siete*

Facing NLP

- Levels of NLP processing (III)
  - Different types of ambiguity:
    - Lexical ambiguity
    - Sintactic ambiguity
    - Semantic ambiguity
    - Reference

Facing NLP

- Lexical ambiguity (examples):
  - *Mi amigo Juan Mesa se mesa la barba al lado de la mesa.*
  - *El cura recibió una cura completa.*

- From Financial Times
  - *US officials has expected Basra to fall early*
  - *Music sales will fall by up to 15% this year*
  - *No missiles have fallen and …*

Facing NLP

- Levels of NLP processing (III)

Sense 10
fall -- (be captured; "The cities fell to the enemy")
=> yield -- (cease opposition; stop fighting)

Sense 2
descend, fall, go down, come down -- (move downward but not necessarily all the way; "The temperature is going down"; "The barometer is falling"; "Real estate prices are coming down")
=> travel, go, move, locomote -- (change location; ...)

Sense 1
fall -- (descend in free fall under the influence of gravity; "The branch fell from the tree"; "The unfortunate hiker fell into a crevasse")
=> travel, go, move, locomote -- (change location; ...)

Facing NLP

- Levels of NLP processing (III)

  Sintactic ambiguity (examples):

  - *La vendedora de periódicos del barrio.*
  - *El policía observó al sospechoso con unos prismáticos.*

  Different meanings depending on parsing!

Facing NLP

- Levels of NLP processing (III)

  Semantic ambiguity (examples):

  Para el cumpleaños les daré un pastel a los niños
  One for all? One to one?

  Reference ambiguity (examples):

  Él le dijo después que lo pusiera encima.
  Who? To whom? After what? What? Where?

Facing NLP

- Levels of NLP processing (III)

  Semantic:

  John is sick. He has the flu.

  Pragmatic:

  John cannot come. He has the flu.

Facing NLP

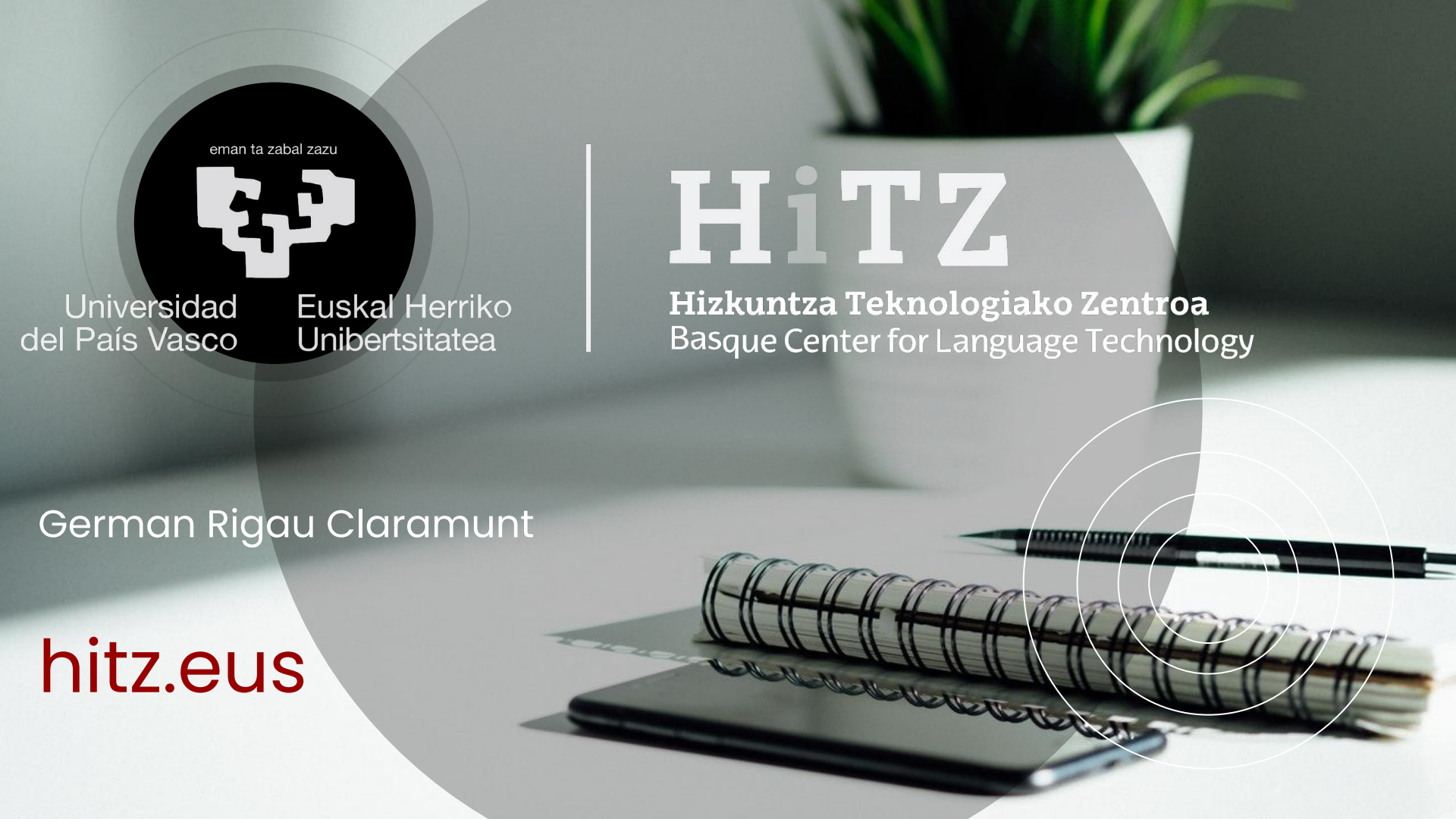
- Levels of NLP processing (III)

  Exercice:

  John was hungry.
  He opened the refrigerator.

Facing NLP

- Multidisciplinar research area
  - Linguistics: Study of language
  - Psycholinguistics: how people communicate.
  - Computer Science: computer models (algorithms) for NLP
  - Philosophy: semantics, meaning, understanding
  - Logic: formal reasoning mechanisms
  - Artificial Intelligence: techniques, knowledge representation, commonsense, etc.
  - Statistics: probabilistic models of language.
  - Machine Learning: learning rules and models
  - Deep Learning: learning large neural language models
  - Linguistic Engineering: implementation of large and complex NLP systems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