

Morphology

- ▶ Study of how words form
- ▶ Derivational morphology: create a new *lexeme* from a base
 - estrangle (v) => estrangement (n)
 - become (v) => unbecoming (adj)
 - ▶ May not be totally regular: enflame => inflammable
- ▶ Inflectional morphology: word is inflected based on its context
 - I become / she becomes
 - ▶ Mostly applies to verbs and nouns

- In English:
- | | | |
|-----------|------------|-------------------|
| I arrive | you arrive | he/she/it arrives |
| | | [X] arrived |
| we arrive | you arrive | they arrive |

		singular			plural		
		first	second	third	first	second	third
indicative		je (j')	tu	il, elle	nous	vous	ils, elles
(simple tenses)	present	arrive /a.ʁiv/	arrives /a.ʁiv/	arrive /a.ʁiv/	arrivons /a.ʁi.vɔ̃/	arrivez /a.ʁi.ve/	arrivent /a.ʁiv/
	imperfect	arrivais /a.ʁi.vɛ/	arrivais /a.ʁi.vɛ/	arrivait /a.ʁi.vɛ/	arrivions /a.ʁi.vʝɔ̃/	arriviez /a.ʁi.vʝe/	arrivaient /a.ʁi.vɛ/
	past historic ²	arrivai /a.ʁi.vɛ/	arrivas /a.ʁi.va/	arriva /a.ʁi.va/	arrivâmes /a.ʁi.vam/	arrivâtes /a.ʁi.vat/	arrivèrent /a.ʁi.vɛʁ/
	future	arriverai /a.ʁi.vʁɛ/	arriveras /a.ʁi.vʁa/	arrivera /a.ʁi.vʁa/	arriverons /a.ʁi.vʁɔ̃/	arriverez /a.ʁi.vʁe/	arriveront /a.ʁi.vʁɔ̃/
	conditional	arriverais /a.ʁi.vʁɛ/	arriverais /a.ʁi.vʁɛ/	arriverait /a.ʁi.vʁɛ/	arriverions /a.ʁi.və.ʁʝɔ̃/	arriveriez /a.ʁi.və.ʁʝe/	arriveraient /a.ʁi.vʁɛ/

Morphological Inflection

► In Spanish:

		singular			plural		
		1st person	2nd person	3rd person	1st person	2nd person	3rd person
indicative		yo	tú vos	él/ella/ello usted	nosotros nosotras	vosotros vosotras	ellos/ellas ustedes
	present	llego	llegas ^{tú} llegás ^{vos}	llega	llegamos	llegáis	llegan
	imperfect	llegaba	llegabas	llegaba	llegábamos	llegabais	llegaban
	preterite	llegué	llegaste	llegó	llegamos	llegasteis	llegaron
	future	llegaré	llegarás	llegará	llegaremos	llegaréis	llegarán
	conditional	llegaría	llegarías	llegaría	llegaríamos	llegaríais	llegarían

Morphological Inflection

- ▶ Not just verbs either; gender, number, case complicate things

Declension of Kind [hide ▲]					
	singular			plural	
	indef.	def.	noun	def.	noun
nominative	ein	das	Kind	die	Kinder
genitive	eines	des	Kindes, Kinds	der	Kinder
dative	einem	dem	Kind, Kinde ¹	den	Kindern
accusative	ein	das	Kind	die	Kinder

- ▶ Nominative: I/he/she, accusative: me/him/her, genitive: mine/his/hers
- ▶ Dative: merged with accusative in English, shows recipient of something
I taught the children <=> Ich unterrichte die Kinder
I give the children a book <=> Ich gebe den Kindern ein Buch

Irregular Inflection

- ▶ Common words are often irregular
 - ▶ I am / you are / she is
 - ▶ Je suis / tu es / elle est
 - ▶ Soy / está / es
- ▶ Less common words typically fall into some regular *paradigm* — these are somewhat predictable

Agglutinating Languages

- Finnish/Hungarian (Finno-Ugric), also Turkish: what a preposition would do in English is instead part of the verb

		active	passive
1st		halata	
long 1st ²		halatakseen	
2nd	inessive ¹	halatessa	halattaessa
	instructive	halaten	—
3rd	inessive	halaamassa	—
	elative	halaamasta	—
	illative	halaamaan	—
	adessive	halaamalla	—
	abessive	halaamatta	—
	instructive	halaaman	halattaman
	nominative	halaaminen	
4th	partitive	halaamista	
5th ²		halaamaisillaan	

indicative mood					
present tense					
person	positive	negative	perfect	positive	negative
1st sing.	halatan	en halata	1st sing.	olen halannut	en ole halannut
2nd sing.	halatat	et halata	2nd sing.	olet halannut	et ole halannut
3rd sing.	halataa	ei halata	3rd sing.	on halannut	ei ole halannut
1st plur.	halataamme	emme halata	1st plur.	ollemme halanneet	emme ole halanneet
2nd plur.	halatatte	ette halata	2nd plur.	ollette halanneet	ette ole halanneet
3rd plur.	halatavat	ovat halata	3rd plur.	ovat halanneet	ovat ole halanneet
passive	halataan	ei halata	passive	on halattu	ei ole halattu
past tense					
pluperfect					
person	positive	negative	person	positive	negative
1st sing.	halasin	en halannut	1st sing.	olin halannut	en ollut halannut
2nd sing.	halasit	et halannut	2nd sing.	olit halannut	et ollut halannut
3rd sing.	halasi	ei halannut	3rd sing.	oli halannut	ei ollut halannut
1st plur.	halasimme	emme halanneet	1st plur.	olimme halanneet	emme olleet halanneet
2nd plur.	halasitte	ette halanneet	2nd plur.	olitte halanneet	ette olleet halanneet
3rd plur.	halasivat	ovat halanneet	3rd plur.	olivat halanneet	ovat olleet halanneet
passive	halattiin	ei halattu	passive	oli halattu	ei ollut halattu
conditional mood					
present					
person	positive	negative	perfect	positive	negative
1st sing.	halaisin	en halaisi	1st sing.	olisin halannut	en olisi halannut
2nd sing.	halaisit	et halaisi	2nd sing.	olisit halannut	et olisi halannut
3rd sing.	halaisi	ei halaisi	3rd sing.	olisi halannut	ei olisi halannut
1st plur.	halaisimme	emme halaisi	1st plur.	olisimme halanneet	emme olisi halanneet
2nd plur.	halaisitte	ette halaisi	2nd plur.	olisitte halanneet	ette olisi halanneet
3rd plur.	halaisivat	ovat halaisi	3rd plur.	olisivat halanneet	ovat olisi halanneet
passive	halattaisiin	ei halattaisi	passive	olisi halattu	ei olisi halattu
imperative mood					
present					
person	positive	negative	perfect	positive	negative
1st sing.	—	—	1st sing.	—	—
2nd sing.	halata	älä halata	2nd sing.	ole halannut	älä ole halannut
3rd sing.	halatakoon	äläköön halatako	3rd sing.	olkoon halannut	äläköön ole halannut
1st plur.	halatakaamme	äläkäämme halatako	1st plur.	olkaamme halanneet	äläkäämme ole halanneet
2nd plur.	halatkaa	äläkä halatkaa	2nd plur.	olkaa halanneet	äläkä olo halanneet
3rd plur.	halatko	äläkö halatko	3rd plur.	olko halanneet	äläkö olo halanneet
passive	halattakoon	äläköön halattakoo	passive	olkoon halattu	äläköön ole halattu
potential mood					
present					
person	positive	negative	perfect	positive	negative
1st sing.	halan	en halanne	1st sing.	olen halannut	en ole halannut
2nd sing.	halat	et halanne	2nd sing.	olet halannut	et ole halannut
3rd sing.	halaa	ei halanne	3rd sing.	on halannut	ei ole halannut
1st plur.	halamme	emme halanne	1st plur.	ollemme halanneet	emme ole halanneet
2nd plur.	halatte	ette halanne	2nd plur.	ollette halanneet	ette ole halanneet
3rd plur.	halavat	ovat halanne	3rd plur.	ovat halanneet	ovat ole halanneet
passive	halataan	ei halanne	passive	on halattu	ei ole halattu
conjunct forms					
infinitives					
active	halata	passive	participles	active	passive
at	halata	halattava	present	halava	halattava
ing 1st ²	halataksaan	halattaksaan	past	halanut	halattu
nd	halatessa	halattessa	past ¹ - 3	halama	halattu
inessive	halatessa	halattessa	negative	halamaton	halattamaton
instructive	halaten	—			
inessive	halaamassa	—			
elative	halaamasta	—			
illative	halaamaan	—			
adessive	halaamalla	—			
abessive	halaamatta	—			
instructive	halaaman	halattaman			
nominative	halaaminen	—			
partitive	halaamista	—			

halata: “hug”

illative: “into”

adessive: “on”

- Many possible forms — and in newswire data, only a few are observed

Morphologically-Rich Languages

- ▶ Many languages spoken all over the world have much richer morphology than English
- ▶ CoNLL 2006 / 2007: dependency parsing + morphological analyses for ~15 mostly Indo-European languages
- ▶ SPMRL shared tasks (2013-2014): Syntactic Parsing of Morphologically-Rich Languages
- ▶ Word piece / byte-pair encoding models for MT are pretty good at handling these if there's enough data