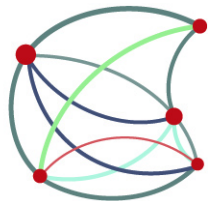


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# Multilingual videos for education

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# 1 Introduction

- Multilingual subtitles are needed for MOOCs and OER
- Automatic (ASR&MT) subtitles are often good enough
- If not, post-edition of automatic subtitles is far more efficient than generating them ex novo
- Real-life results are reported for a MOOC platform (EMMA FP7 project, 2014–2016) and an OER repository (transLectures FP7 project, 2011–2014), that have been just published in:

J. D. Valor, P. Baquero, J. Civera, C. Turro and A. Juan  
Multilingual videos for MOOCs and OER

Journal of Educational Technology & Society, 21 (2), 2018.

## 2 Case studies

- ***The EMMA platform***

- Developed in the FP7 project EMMA (2014–2016)
- 12 partners delivering more than 30 multilingual MOOCs

- ***The UPV media repository***

- UPV's repository of educational video lectures
- Studied in the FP7 project transLectures (2011–2014)
- Basic statistics:

Language	Videos	Hours	Lecturers
Spanish	15013	2709	1572
English	1221	173	203
Catalan	434	52	80

# 3 Systems, tools and integration components

- transLectures-UPV toolkit (TLK) for ASR (similar to Kaldi/RASR)
- Moses toolkit for MT (still state-of-the-art just 3 years ago)
- Language model adaptation to in-domain data
- transLectures-UPV Platform (TLP) for subtitling post-edition:

The screenshot displays a video player interface. On the left, a video frame shows a man speaking. A subtitle overlay reads: "aromatic grape varieties, is produced". Below the video is a timeline and a list of subtitle segments with their corresponding audio waveforms. On the right, a panel shows a list of subtitle segments in French and their English translations, each with a character per second (cps) value. The segments are:

French Text	English Translation	cps
qui est bien compensée par l'acidité. Les arômes en rétro-nasal se combinent	which is balanced by its acidity. Along the retro-nasal pathway, the aromas combine	13.2 cps
bien avec l'acidité donnant au vin assez de longueur.	well with the acidity of the wine, giving it good length.	14.6 cps
Ce Muscat d'Alsace dont les notes fruitées sont caractéristiques des	This Muscat from Alsace, with fruity notes that are characteristic of	18.0 cps
cépages dits aromatiques est obtenu	aromatic grape varieties, is produced	12.4 cps
par un élevage dans des contenants neutres	by ageing in neutral containers,	13.9 cps
de type cuves en inox. Le choix de ce contenant	like stainless steel vats. Choosing this type of container	13.6 cps
assure ainsi la préservation de cette composante aromatique en	ensures the preservation of this aromatic component by	15.7 cps
limitant les phénomènes d'oxydation	limiting oxidation phenomena during this	

# 4 Transcription and translation quality

## Transcription quality

Language	WER
Spanish	18.4
Italian	25.7
English	21.9
Dutch	29.4
French	23.2
Average:	<b>23.7</b>

## Translation quality

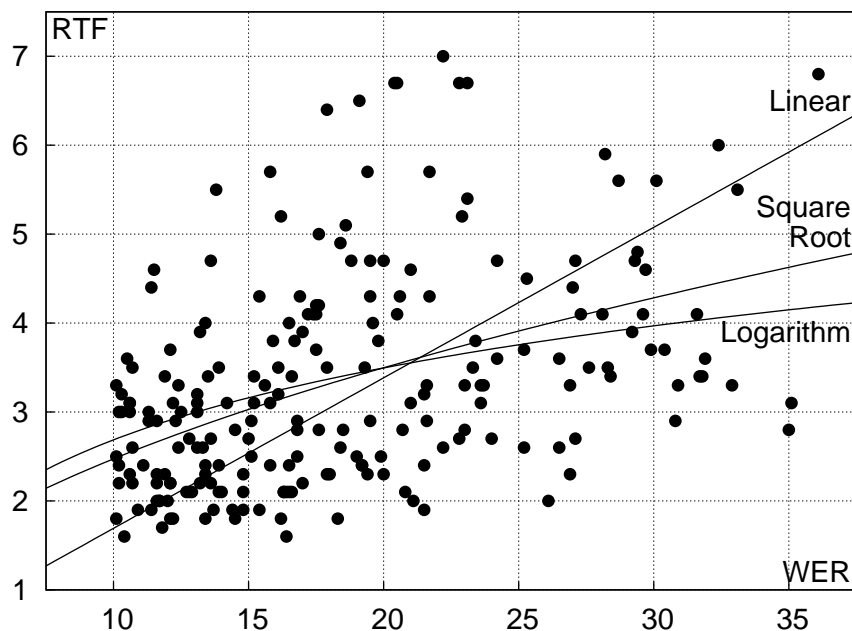
Tl. pair	TER
Es → En	33.2
En → Es	27.0
It → En	37.5
En → It	33.8
Nl → En	30.7
Fr → En	58.9
Average:	<b>36.9</b>

Language	WER EMMA	WER Mains.
Spanish	14.8	22.5
Italian	17.1	31.6
English	39.2	65.9
Dutch	24.5	41.1
French	20.6	32.0
Average:	<b>23.2</b>	<b>38.6</b>

Tl. pair	TER EMMA	TER Mains.
Es→En	33.9	44.3
En→Es	35.8	42.4
It→En	33.4	39.2
En→It	39.7	43.3
Nl→En	42.5	45.0
Fr→En	52.8	52.6
Average:	<b>39.7</b>	<b>44.5</b>

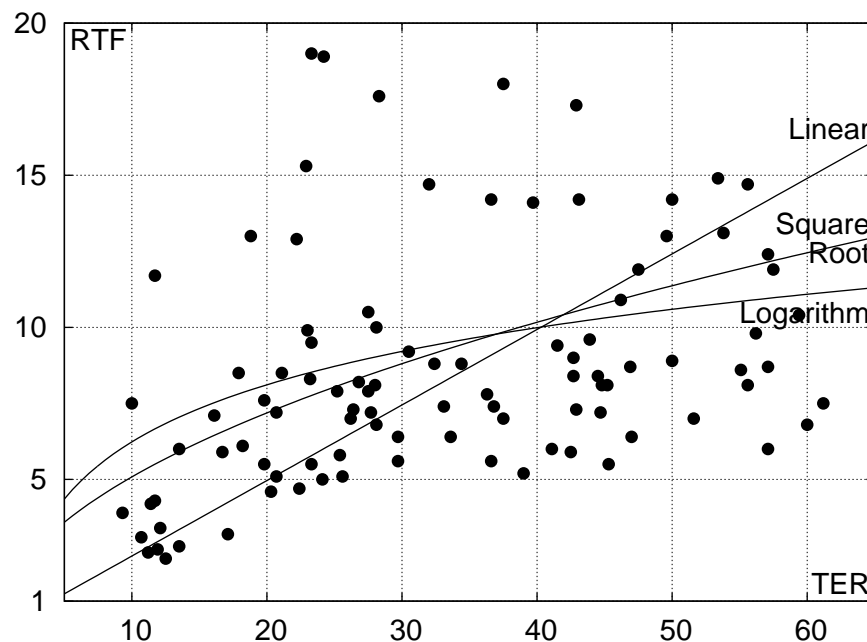
# 5 Reviewing time

## Transcription: RTF vs WER



Language	WER	RTF
Spanish	18.4	3.3
Italian	25.7	3.9
English	21.9	5.3
Dutch	29.4	5.8
French	23.2	6.7
Ex novo		10.0

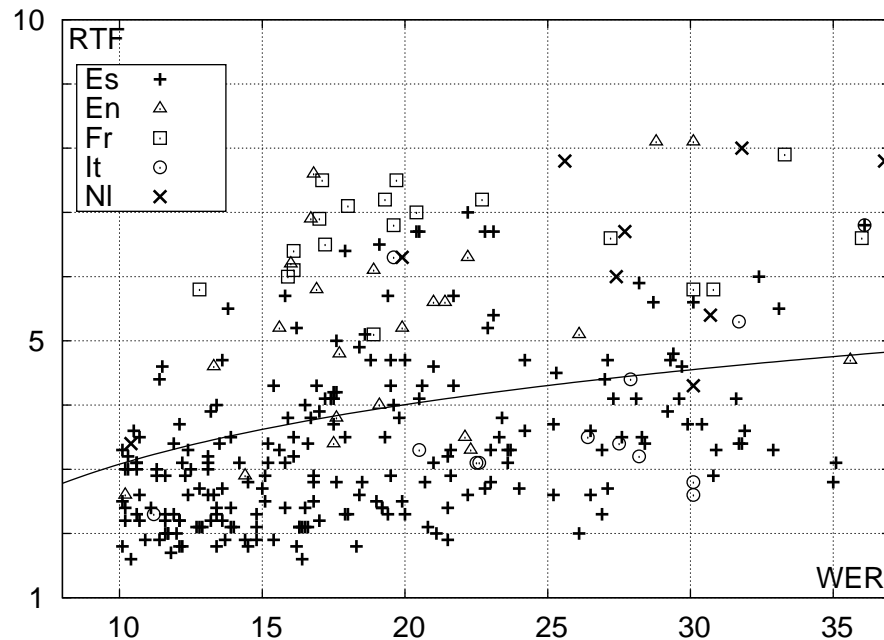
## Translation: RTF vs TER



Tr. pair	TER	RTF
Es→En	33.2	9.1
En→Es	27.0	7.8
It→En	37.5	11.3
En→It	33.8	9.6
Nl→En	30.7	9.5
Fr→En	58.9	23.2
Ex novo		30.0

# Reviewing time across languages

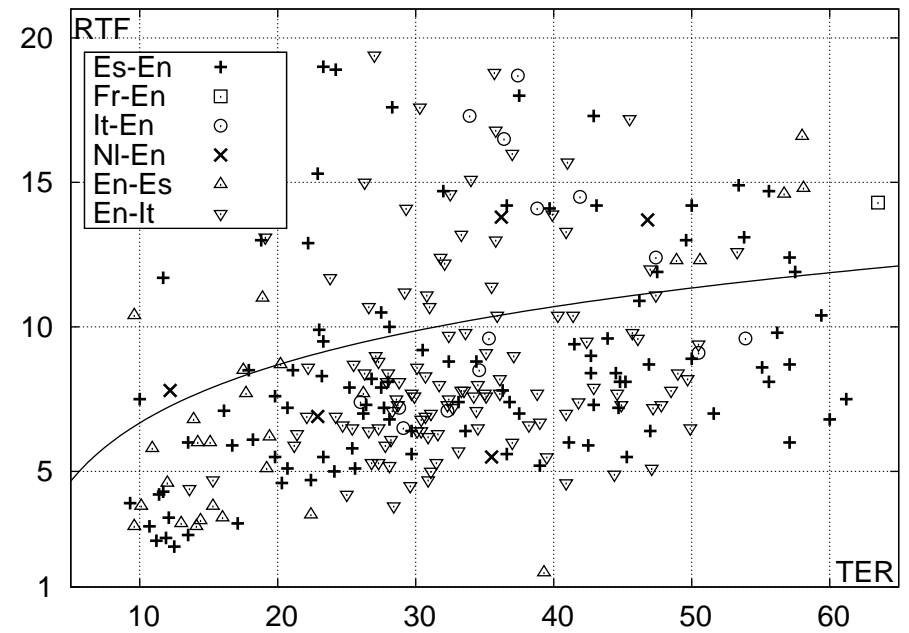
## Transcription: RTF vs WER



*Log fit stat. significant*

For 1h at 10% WER: 3h

## Translation: RTF vs TER



*Log fit stat. significant*

For 1h at 30% TER: 9h

**Time saving: 70%** independently of the lang. (pair)



## 6 Impact on the case studies

### *The EMMA platform*

(Non-)native enrollments:

Lang.	Nat.	Non	$\Delta\%$
Spanish	161	547	340
French	983	879	89
Italian	609	259	43
Dutch	501	104	21
English	351	27	8
Total	2605	1816	70

***Enrollment increase: 70%***

$$\frac{1816}{2605}$$

### *The UPV media repository*

Video/subtitle Kviews (15/16):

Video lang.	Video views	Sub. views Es	Sub. views En
Spanish	629	6.9	1.1
English	63	1.3	0.5
Total	692	8.2	1.6

***Sub. views increase: 24%***

$$\frac{1.1+1.3}{6.9+1.1+1.3+0.5}$$

## 7 Conclusions and future work

- Reported experience (2011–2016) on using ASR and MT to produce (automatic) multilingual subtitles for educational videos.
- Automatic subtitles are often good enough to be directly used.
- If not, post-edition of automatic subtitles is far more efficient than generating them ex novo: 70% of time saving on average.
- Impact on case studies was also important: 70% of enrollment increase in the EMMA platform and 24% of subtitle views increase in an OER repository.
- Future work: multilingual, on-line (distant) ASR (+MT+TTS).

## Future work: 2017 update

Language	Data (hours)		Word Error Rate			RTF	
	2016	2017	2016	2017	$\Delta$	2016	2017
Spanish	200	800	15.0	11.7	- 22%	1.5	0.8
Catalan	50	2430	17.8	16.6	- 7%	1.2	0.7
English	430	2550	26.7	22.2	- 17%	2.0	1.5
German	300	880	27.0	22.5	- 17%	1.2	1.0
French	80	670	21.3	16.5	- 23%	2.1	1.0
Italian	130	740	27.8	25.4	- 9%	0.7	0.7
Dutch	300	620	27.5	26.7	- 3%	1.5	0.9
Portuguese	120	530	34.4	23.3	- 32%	1.0	1.0
Slovene	90	90	38.6	33.9	- 12%	1.9	1.1
Average	190	1030	26.2	22.1	- 16%	1.4	0.9

*Follow-up: H2020 project X5gon from 2017 to 2020*

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***Thank you very much for your attention!***