NiCT
Language Translation

ATR
Spoken Language Communication

Overview of the IWSLT 2008 Evaluation Campaign

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NiCT Language Translation

Outline of Talk

ATR Spoken Language Communication

1. Evaluation Campaign:

- schedule
- participants
- language resources
- evaluation specifications

2. Evaluation Results:

- automatic evaluation
- subjective evaluation
- correlation between evaluation metrics
- grader consistency

3. Discussions:

- Challenge Task 2008
- innovative idea's explored by participants

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Evaluation Campaign Schedule

Event	Date
MT system registration	Apr 04, 2008
release of training/development sets	Jun 02, 2008
release of test sets	Jun 30, 2008
run submission	Jul 04, 2008
result feedback (automatic metric scores)	Jul 11, 2008
system descriptions	Jul 18, 2008
evaluation server online	Jul 24, 2008
result feedback (subjective evaluation scores)	Aug 22, 2008
camera-ready paper	Sep 05, 2008
IWSLT 2008 workshop	Oct 20-21, 2008

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IWSLT 2008 Participants

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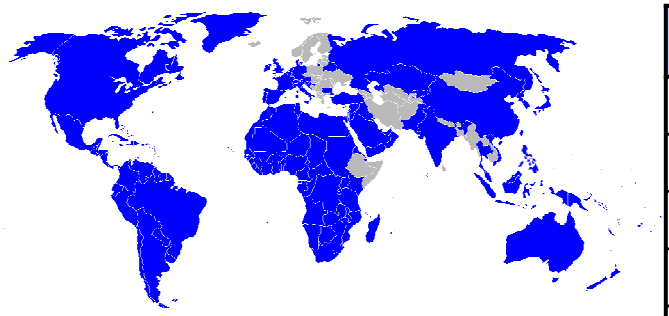

DE: 1 | JP: 3

ES: 1 | KR: 1

FR: 3 | SG: 1

GB: 1 | US: 2

IE: 1 | TR: 1

IT: 1 | ZH: 3

Teams: 19

Engines: 58

Research Group		System
US	Carnegie Mellon University, InterACT	**cmu**
IE	Dublin City University	**dcu**
IT	Fondazione Bruno Kessler	**fbk**
FR	University of Caen Basse-Normandie	**greyc**
SG	Insititute for Infocomm Research	**i2r**
ZH	Chinese Academy of Science, ICT	**ict**
FR	University J. Fourier, GETALP/LIG	**lig**
FR	University of Le Mans, LIUM	**lium ***
US	MIT Lincoln Lab / Air Force Research Lab	**mitll**
JP	NICT-ATR	**nict**
ZH	Chinese Academy of Science, NLPR	**nlpr**
JP	NTT Communication Science Laboratory	**ntt**
KR	Pohang University of Science & Technology	**postech ***
GB	Queen Mary University of London	**qmul ***
DE	Rheinisch Westfählische Hochschule	**rwth**
ES	TALP-UPC Research Center	**talp**
ZH	Toshiba China R&D Center	**tch ***
JP	Tottori University	**tottori**
TR	TÜBİTAK-UEKAE	**tubitak**

* first-time participation

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Data Track Participation

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Task	Translation Direction		Team	Run	
				primary	contrastive
Challenge	English-Chinese	CT_{EC}	7	7	11
	Chinese-English	CT_{CE}	11	11	32
BTEC	Arabic-English	BT_{AE}	10	10	13
	Chinese-English	BT_{CE}	14	14	29
	Chinese-Spanish	BT_{CS}	8	8	5
Pivot	Chinese-(English)-Spanish	PV_{CS}	8	8	11
Total			**19**	**58**	**101**

Language Resources

BTEC → useful sentences together with the translation into other languages usually found in phrasebooks for tourists traveling abroad

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Challenge Task 2008

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- **machine-mediated conversational speech in a real situation**
  - **traveler speech with S2S system**
  - *translation directions:* English ↔ Japanese
    Chinese ↔ Japanese

- **field experiments in Kyoto/Japan**
  - foreign travelers carried out specific tourism-related tasks (*buying souvenirs* or *entrance tickets*, *asking for directions*, etc.)
  - communication with local staff using hand-held translation device
  - speech data of 50 English and 50 Chinese travelers
  - 3-4 tasks per traveler
  - recordings at 5 different locations

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Challenge Task 2008

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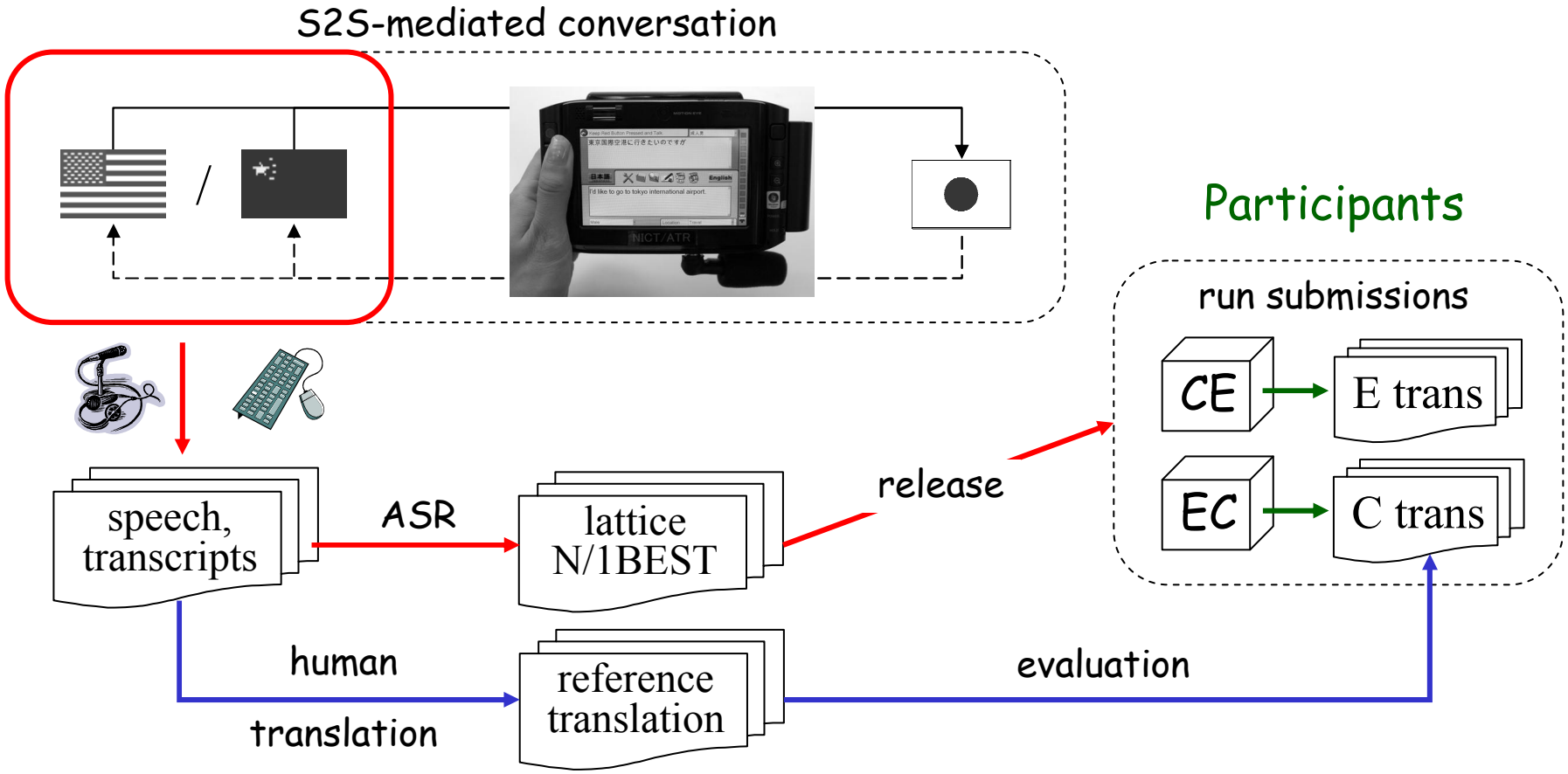

(dev) 250 x ASR output
(test) 500 x ASR output

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Challenge Task Evaluation Data

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Track	Lang	Sen	Length	Word	Voc	Ref
CT_{EC}	**E**	498	**5.8**	**2,867**	**312**	—
	C		5.7	20,016	708	7
CT_{CE}	**C**	504	**5.0**	**2,513**	**385**	—
	E		6.2	21,751	810	7

- comparison of Chinese CT_{CE} (English CT_{EC}) *user utterances* and Chinese CT_{EC} (English CT_{CE}) *human reference translations*
  - user utterances are **shorter**
  - user utterances have **limited vocabulary**
- Chinese sentences are shorter than English

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BTEC/Pivot Task Evaluation Data

ATR Spoken Language Communication

Track	Lang	Sen	Length	Word	Voc	Ref
BT_{CE}	C	507	5.5	2,808	885	—
	E		6.8	55,082	2,146	16
BT_{AE}	**A**	507	**5.1**	**2,585**	**1,205**	**—**
	E		6.8	55,082	2,146	16
BT_{CS} PV_{CS}	C	507	5.5	2,808	885	—
	S		**6.2**	**50,169**	**2,569**	**16**

- shortest utterances with large vocabulary for Arabic (→ word segmentation)
- Spanish references shorter than English ones with larger vocabulary (→ word inflections)

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Translation Task Complexity

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Set	Lang	Entropy	Words	Total Entropy	Track
testset	C	9.51	3,962	35,111	CT_{EC}
	E	10.1	3,662	**36,986**	**CT_{CE}**
		9.83	4,057	**39,880**	**BT_{CE}** BT_{AE}
	S	10.25	3,885	39,821	BT_{CS} PV_{CS}

- lower total entropy for English Challenge Task references

  → **Challenge Task is supposed to be easier than BTEC Task**

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Recognition Accuracy

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Set	Lang	Word (%) Lattice	Word (%) 1BEST	Sentence(%) Lattice	Sentence(%) 1BEST	Track
testset (spont)	C	95.07	85.79	79.56	**53.77**	**CT_{CE}**
	E	87.27	79.77	65.06	53.01	CT_{EC}
testset (read)	A	—	72.80	—	36.10	BT_{AE}
	C	94.20	83.61	80.47	**63.31**	**BT_{CE}** BT_{CS} PV_{CS}

- similar word accuracies for Challenge Task and BTEC Tasks
- 10% difference of 1BEST recognition accuracies on sentence-level

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Evaluation Specifications

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Automatic Evaluation:

- *metric*: $\frac{\text{(BLEU+METEOR)}}{2}$ → all primary run submissions
- **case-sensitive, with punctuation marks** (*official*)
- case-insensitive, without punctuation marks (*additional*)

Human Assessment:

- *metric*: **Fluency/Adequacy** → 4 MT engines per data track
- *metric*: **Ranking** → all primary run submissions

Human Evaluators:

- *method*: **Intra-Grader-Consistency**
- *method*: **Inter-Grader-Consistency**

target language	human evaluator
Chinese	7
English	6
Spanish	11

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Automatic Evaluation

metrics: $\frac{\text{(BLEU+METEOR)}}{2}$

° *official evaluation specifications* (case-sensitive, with punctuations)

BT_{AE}	
mitll	**0.4292**
rwth	0.4020
lium	0.3952
talp	0.3915
tubitak	0.3904
lig	0.3881
dcu	0.3798
postech	0.3360
qmul	0.3126
greyc	0.2467

BT_{CS}	
tch	**0.3109**
fbk	0.2619
tubitak	0.2594
dcu	0.2521
nict	0.2500
talp	0.2359
postech	0.2223
greyc	0.2021

PV_{CS}	
tch	**0.3452**
fbk	0.3212
talp	0.3144
nict	0.3103
tubitak	0.2863
dcu	0.2844
greyc	0.1755
qmul	0.1469

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Automatic Evaluation

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CT_{EC}	
tch	**0.6173**
ict	0.5749
nlpr	0.5708
dcu	0.5599
nict	0.5366
tottori	0.5166
mitll	0.4930

CT_{CE}	
nlpr	**0.5061**
tch	**0.5060**
i2r	0.4882
ict	0.4681
rwth	0.4502
mitll	0.4396
ntt	0.4341
dcu	0.4173
nict	0.3748
fbk	0.3580
tottori	0.3406

BT_{CE}	
tch	**0.5347**
ict	0.5226
cmu	0.5219
nlpr	0.5148
i2r	0.5130
rwth	0.4873
fbk	0.4639
dcu	0.4408
tubitak	0.4295
nict	0.4180
tottori	0.3901
postech	0.3656
greyc	0.3160
qmul	0.2638

Fluency/Adequacy

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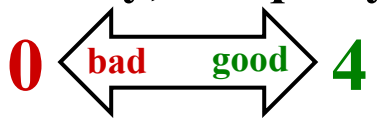
° *metrics*: **median grade of 3 human grades**

fluency, adequacy



fluency

4	Flawless English
3	Good English
2	Non-native English
1	Disfluent English
0	Incomprehensible

adequacy

4	All Information
3	Most Information
2	Much Information
1	Little Information
0	None

	CT_{EC}	CT_{CE}	BT_{CE}	BT_{AE}	BT_{CS}	PV_{CS}
fluency	**2.75** ~ 2.05	**3.27** ~ 2.55	**3.21** ~ 2.35	**3.15** ~ 1.90	**2.50** ~ 1.23	**2.48** ~ 2.03
adequacy	**2.39** ~ 1.66	**2.36** ~ 1.70	**2.46** ~ 1.76	**2.18** ~ 1.45	**1.87** ~ 1.22	**1.81** ~ 1.41

- translation quality:
  - ° fluency : $CT_{CE} > BT_{CE} > BT_{AE} > CT_{EC} > BT_{CS} > PV_{CS}$
  - ° adequacy: $BT_{CE} > CT_{CE} \approx CT_{EC} > BT_{AE} > BT_{CS} > PV_{CS}$

Ranking

"rank each whole sentence translation from Best to Worst relative to the other choices (ties are allowed)"
[Callison-Burch 07]

° graders compared up to 5 MT system outputs per page and assigned a grade of "1" to "5" to each system output

° *metrics*:
average number of times that a system was judged better than any other systems

	CT_{EC}	CT_{CE}	BT_{CE}	BT_{AE}	BT_{CS}	PV_{CS}
ranking	**0.3966**	**0.5274**	**0.5255**	**0.4415**	**0.4773**	**0.4932**
system	tch	nlpr	nlpr	mitll	tch	tch

Paired Comparison

"paired comparison evaluation based on the *Ranking* results"

° *metrics*: gain ($\frac{better - worse}{graded}$) of MT_1 towards MT_2 in %

BT_{CE} $MT_1 \searrow$	$MT_2 \rightarrow$	**tch**	**ict**	**i2r**	**rwth**	**cmu**	**dcu**	**fbk**	…
	nlpr	5.3	9.12	13.09	19.10	12.93	36.60	39.93	
		tch	1.40	16.48	21.48	**11.11**	30.86	30.34	
			ict	**-3.52**	9.77	17.25	25.38	28.09	
				i2r	8.90	16.23	22.63	22.92	
					rwth	**-3.51**	12.00	**11.90**	
						cmu	18.03	**10.34**	
							dcu	**-2.78**	
								fbk	
									⋱

- systems ordered according to *Ranking score*
- negative gains for certain system combinations

→ **inconsistency of *Ranking* metrics?**

Best Rank Difference

- use MT system with highest ranking score as point-of-reference
- rank systems according to difference in rank towards best system
  - *metrics*: gain ($\frac{better - worse}{graded}$) of the top MT towards any other system in %

BestRankDiff

0 good bad **1**

Ranking	BT_{CE}		*worse*	*same*	*better*
nlpr	nlpr	0.00	—	—	—
tch	tch	5.28	27.81	39.10	33.09
ict	ict	9.12	26.31	38.26	35.43
i2r	**cmu**	**12.92**	25.17	36.74	38.09
rwth	i2r	13.04	22.82	41.32	35.86
cmu	**rwth**	**19.10**	22.47	35.96	41.57
dcu	fbk	36.60	15.47	32.46	52.07
fbk	dcu	40.14	11.31	37.24	51.45

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Correlation between Automatic Evaluation and Ranking

° *Spearman's rank correlation coefficient* $\rho \in \{-1.0, 1.0\}$

$\rho = -1$ → perfect inverse correlation
$\rho = 0$ → no correlation
$\rho = +1$ → perfect correlation

task	metric	(B+M)/2
CT_{EC} (7)	Ranking	0.1071
	BestRankDiff	0.1071
BT_{CS} (8)	Ranking	0.1190
	BestRankDiff	-0.1667
PV_{CS} (8)	Ranking	0.0238
	BestRankDiff	**0.6190**

task	metric	(B+M)/2
CT_{CE} (11)	Ranking	0.4000
	BestRankDiff	**0.8727**
BT_{CE} (14)	Ranking	0.3736
	BestRankDiff	**0.5769**
BT_{AE} (10)	Ranking	-0.0667
	BestRankDiff	**0.9152**

Grader Consistency

agreement:	κ<0	~0.2	~0.4	~0.6	~0.8	~1.0
	none	slight	fair	moderate	substantial	perfect

Intra-Grader	κ Coefficient					
	CT_{EC}	CT_{CE}	BT_{CE}	BT_{AE}	BT_{CS}	PV_{CS}
fluency	0.64	0.71	**0.75**	0.71	0.52	0.54
adequacy	0.74	0.68	**0.81**	0.61	0.67	0.70
ranking	**0.73**	0.56	0.69	0.56	0.52	0.56

- mainly substantial agreement for *adequacy* and *fluency*
- mainly moderate agreement for *ranking*

→ intra-grader agreement: English > Chinese > Spanish

Grader Consistency

agreement:	κ<0	~0.2	~0.4	~0.6	~0.8	~1.0
	none	slight	fair	moderate	substantial	perfect

Inter-Grader	κ Coefficient					
	CT_{EC}	CT_{CE}	BT_{CE}	BT_{AE}	BT_{CS}	PV_{CS}
fluency	0.41	0.38	0.41	**0.44**	**0.19**	**0.25**
adequacy	0.40	0.41	0.46	**0.47**	**0.26**	**0.30**
ranking	**0.57**	0.52	0.56	0.54	0.47	0.51

- mainly moderate agreement between different graders
- best agreement for *ranking*
- only **slight~fair agreement** for Spanish

→ inter-grader agreement: Chinese = English >> Spanish

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Challenge Task 2008

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° machine-mediated spontaneous speech collected using inexperienced users in a real situation

→ **much easier than Challenge Task 2006**
(spontaneous Chinese utterances of simulated Q&A scenarios)

° comparison to BTEC Task:

- **CT_{CE} sentences shorter and less complex** than BT_{CE} sentences

  … but: **ASR output translation quality lower**

- **CT_{CE} and BT_{CE} recognition performance similar** for lattice input (word: 95%, sentence: 80%) and 1BEST word accuracy (84%)

  … but: **1BEST sentence-level accuracy 10% worse**

→ **most participants used only 1BEST** ☹

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Innovative Ideas Explored by Participants

- additional (synthetic) training resources by translating in-domain monolingual resources
- advanced techniques for phrase-extraction from NBEST alignments
- improved statistical modeling techniques
- new rescoring/reranking methods of NBEST lists
- improved system combinations using hybrid MT engines

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Acknowledgements

ATR Spoken Language Communication

- ***data preparation***
  - NICT/ATR: Gen Itoh, Shigeki Matsuda
  - CMU: Mark Fuhs
- ***automatic evaluation software***
  - JHU: Chris Callison-Burch
  - CMU: Matthias Eck
- ***human assessment***
  - TOSHIBA team (Chinese)
  - UPC-TALP team (Spanish)
  - FBK team (English)
  - NICT/ATR team (English, Chinese)
- ***participation***
  - **all of you !**

THANK YOU !

