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Towards Automatic Face-to-Face Translation

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"Towards a translation system for the audio-visual age"

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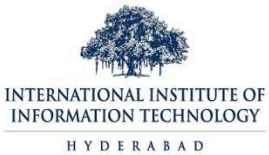

*** The first two authors have contributed equally in this work.**

Talking face videos

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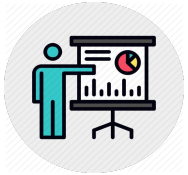
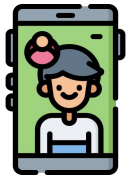
TV News broadcast and interviews



Thousands of lecture and MOOC videos

Thousands of movies in local languages

Making characters talk in animated movies



Video conferencing

½ of the smartphone users make video calls[1]

300 hrs of videos uploaded to YouTube per minute[1]

[1] NPD Press release, 2016 (link)

All images are taken from Google Images for illustration purposes only.

Translating talking face videos

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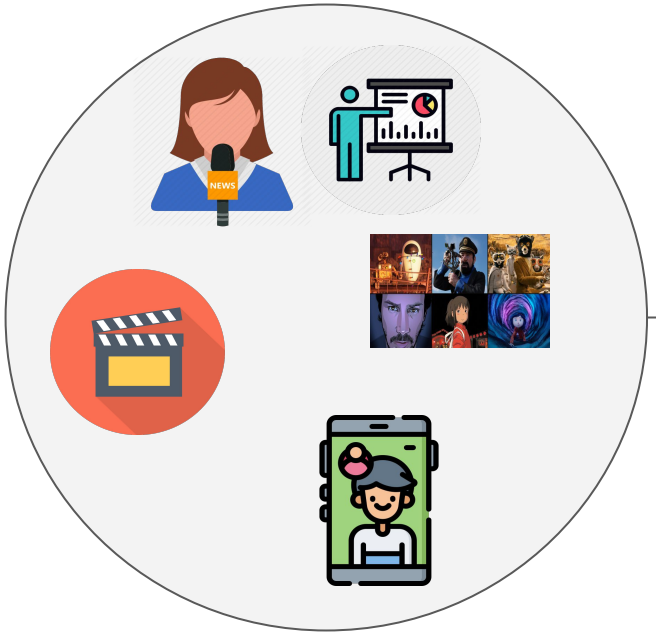
Language A



Viewer who knows only

Language B

Evolution of translation systems

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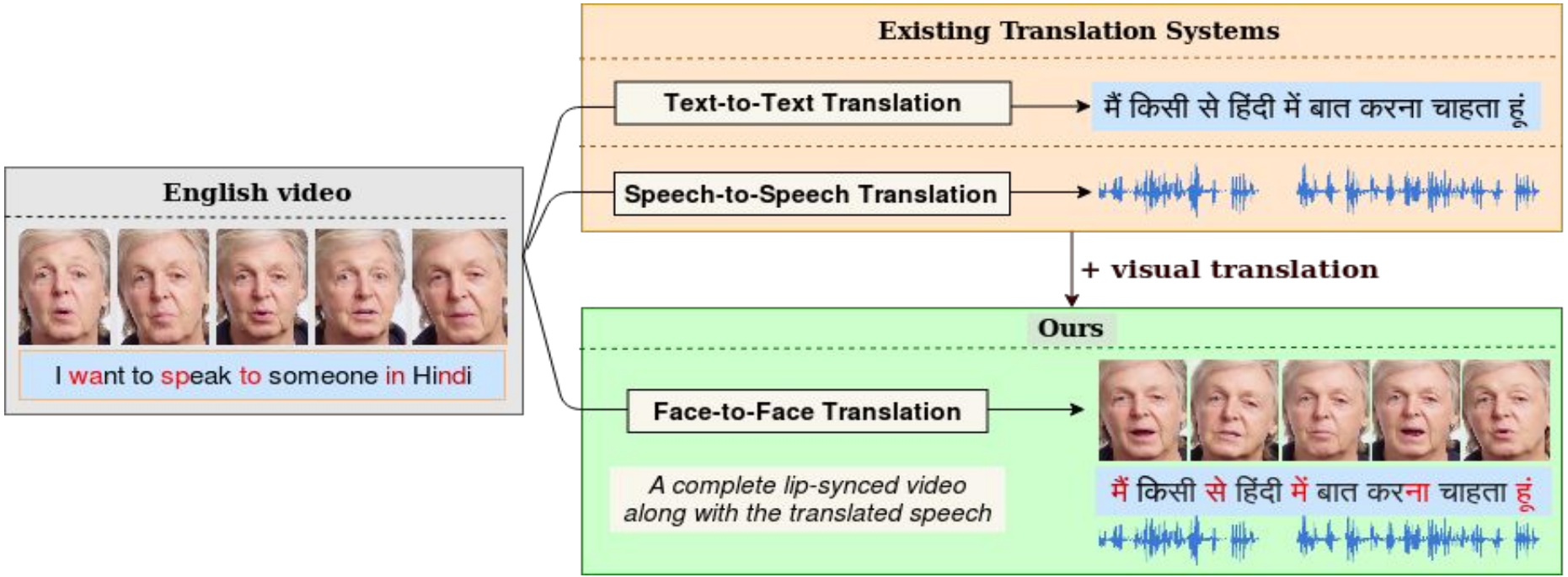

Face-to-Face Translation Pipeline

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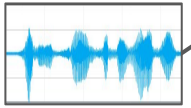
Original Video
in Language L1



Speech in
Language L1

Speech-to-Speech Translation

Automatic Speech Recognition

Machine Translation

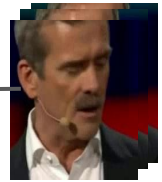
Text-to-Speech System + Voice Transfer

Speech in
Language L2

Lip Synchronization

LipGAN

Lip-Synced Video in
Language L2



Original Video
in Language L1

Speech-to-Speech Translation

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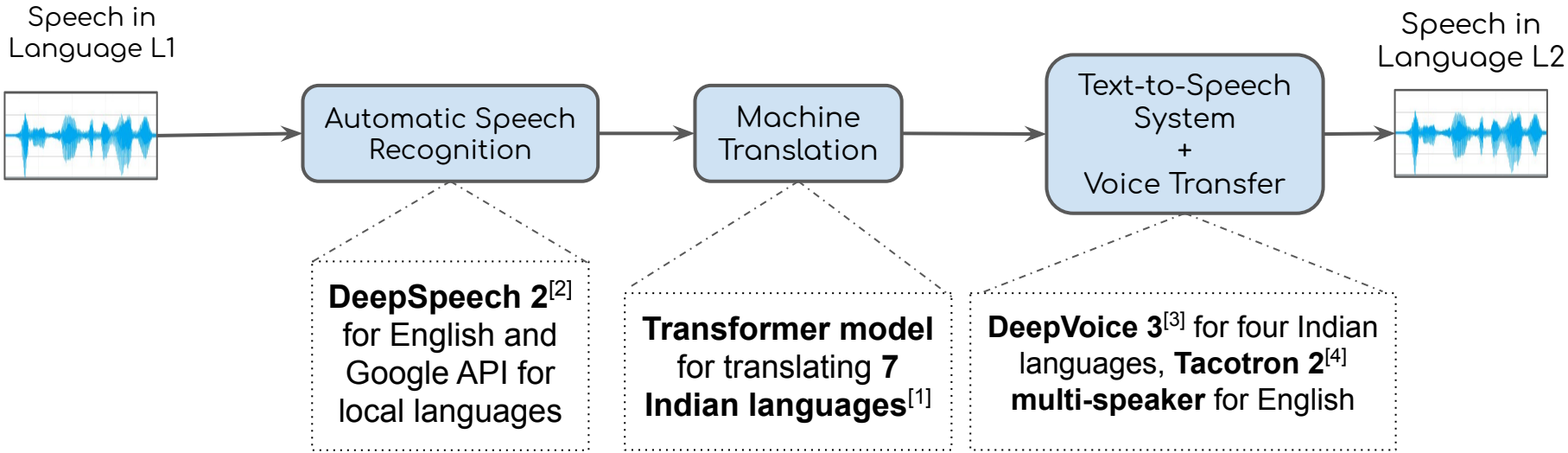

[1] CVIT-MT Systems for WAT-2018, arXiv 2019
[2] Deep Speech 2: End-to-End Speech Recognition in English and Mandarin, ICML 2015
[3] Deep Voice 3: Scaling Text-to-Speech with Convolutional Sequence Learning, ICLR 2017
[4] Natural TTS Synthesis by Conditioning WaveNet on Mel Spectrogram Predictions, arXiv 2017

Recent works in Talking Face Generation

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Paper	Works for any face	Cross-language	Self-supervised	Seamless blending	Extra supervision for accurate lip-sync
Synthesizing Obama [1]	x	x	✓	✓	x
ObamaNet [2]	x	x	x	✓	x
Talking Face [3]	✓	x	x	x	✓
You Said That? [4]	✓	✓	✓	x	x
LipGAN (ours)	✓	✓	✓	✓	✓

[1] Synthesizing Obama: Learning Lip Sync from Audio, *SIGGRAPH 2017*
[2] ObamaNet: Photo-realistic lip-sync from text, *NeurIPS 2017 Workshop*
[3] Talking Face Generation by Adversarially Disentangled Audio-Visual Representation, *AAAI 2019*
[4] You Said That? , *BMVC 2017*

LipGAN

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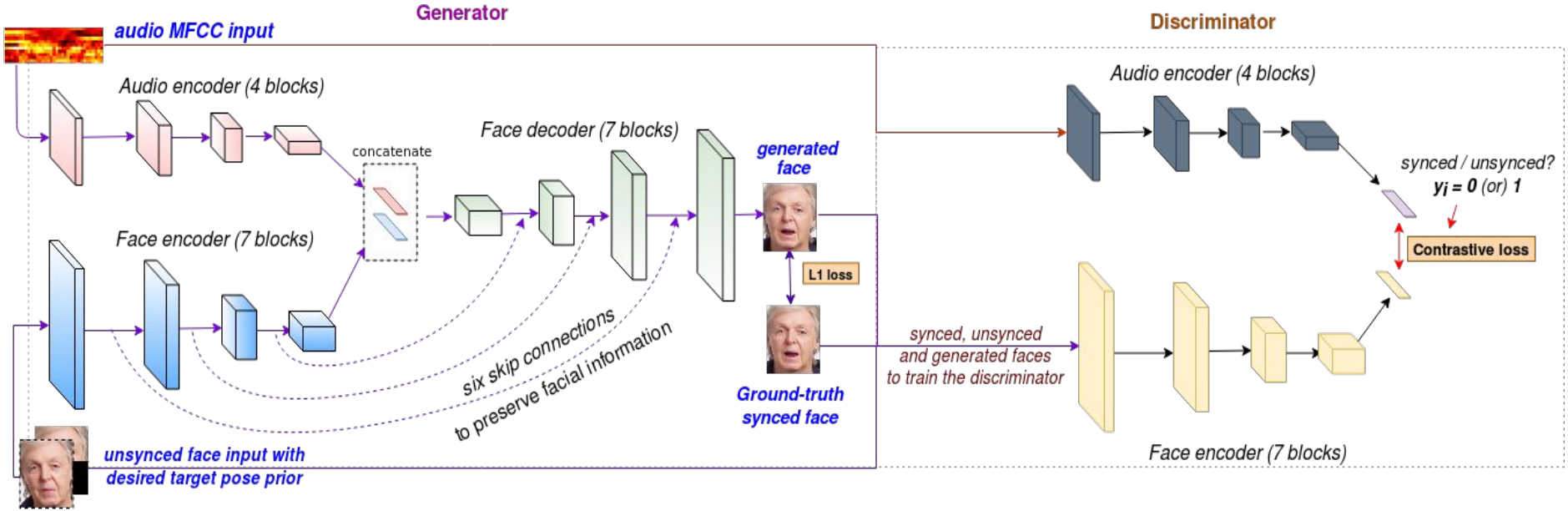
Generator
audio MFCC input
Audio encoder (4 blocks)
Face encoder (7 blocks)
concatenate
Face decoder (7 blocks)
generated face
L1 loss
six skip connections
to preserve facial information
Ground-truth synced face
unsynced face input with desired target pose prior
Discriminator
Audio encoder (4 blocks)
synced / unsynced?
y_i = 0 (or) 1
Contrastive loss
synced, unsynced and generated faces to train the discriminator
Face encoder (7 blocks)

Results

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Face-to-Face Translation

LipGAN on Animated Characters

Thank you

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We thank Google for providing a travel grant which allowed me to travel to France and attend ACM Multimedia, 2019

For more information please visit,
https://cvit.iiit.ac.in/research/projects/cvit-projects/facetoface-translation

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