
# Augmenting Human Creativity with AI

**Hao-Wen (Herman) Dong**

Department of Performing Arts Technology
School of Music, Theatre & Dance
University of Michigan
hermandong.com

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# Music & Technology Co-evolves


Hildegard Dodel, Public domain, via Wikimedia Commons.
Taken at Hamamatsu Museum of Musical Instruments, August 2019.
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Art challenges Technology



Creativity

Augmenting Human Creativity with AI

AI



Technology inspires the Art

# Generative AI for Music, Audio & Video Creation

(Source: The Denver Post)


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(Source: Descript)




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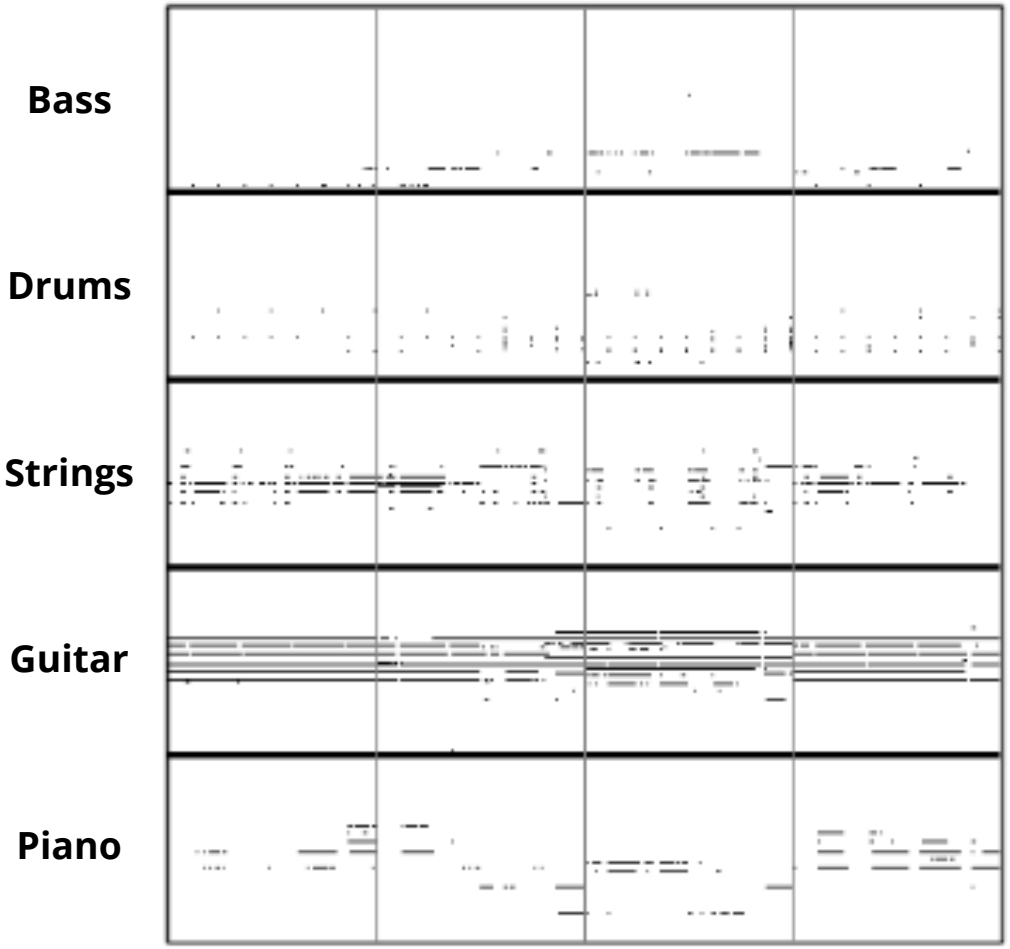
uploadvr.com/iron-man-vr-breaks-free-from-cords-load-screens-on-quest-2/
descript.com/blog/article/what-is-the-best-audio-interface-for-recording-a-podcast
denverpost.com/2019/08/02/colorado-symphony-movie-scores-harry-potter-star-wars/
dailybruin.com/2023/08/04/theater-review-the-musical-les-misrables-offers-stellar-displays-and-impassioned-vocals

# Augmenting Human Creativity with AI

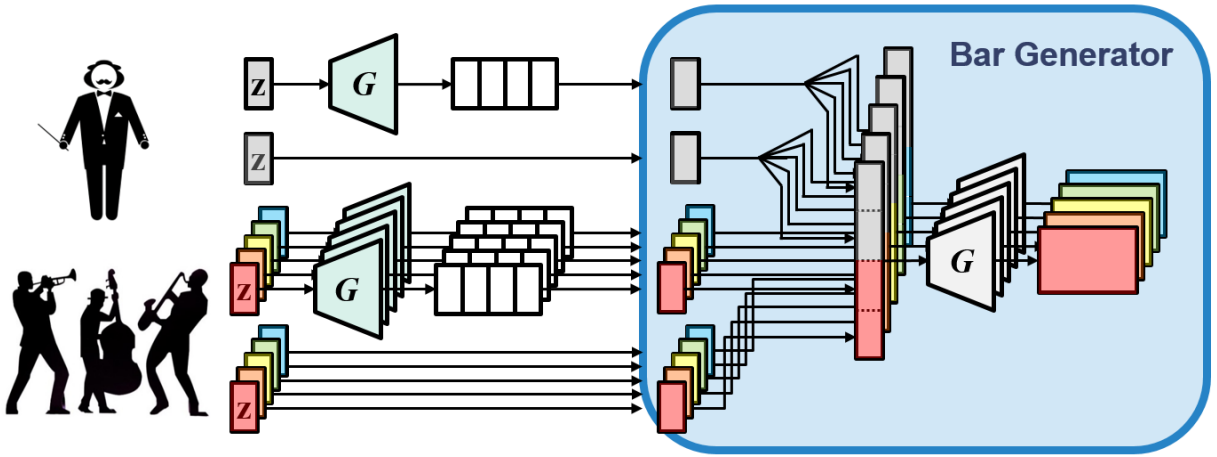
- **Novel Generative Models for New Domains**
  - **Multitrack music generation** (AAAI 2018, ISMIR 2018, ISMIR 2020, ICASSP 2023, ISMIR 2024), **text-to-music generation** (ISMIR 2025), **video-to-music generation** (ISMIR 2025), **symbolic music processing tools** (ISMIR LBD 2019, ISMIR 2020)
- **AI-assisted Tools for Content Creation**
  - **Violin performance synthesis** (ICASSP 2022, ICASSP 2025), **music instrumentation** (ISMIR 2021), **music arrangement** (AAAI 2018), **music harmonization** (JNMR 2020)
- **Multimodal Generative Models for Content Creation**
  - **Long-to-short video editing** (ICLR 2025, NeurIPS 2025), **text-queried sound separation** (ICLR 2023), **text-to-audio synthesis** (WASPAA 2023)

# Generating Multi-instrument Music using GANs (**AAAI 2018**)

## Multitrack Piano Roll




## MuseGAN Generator

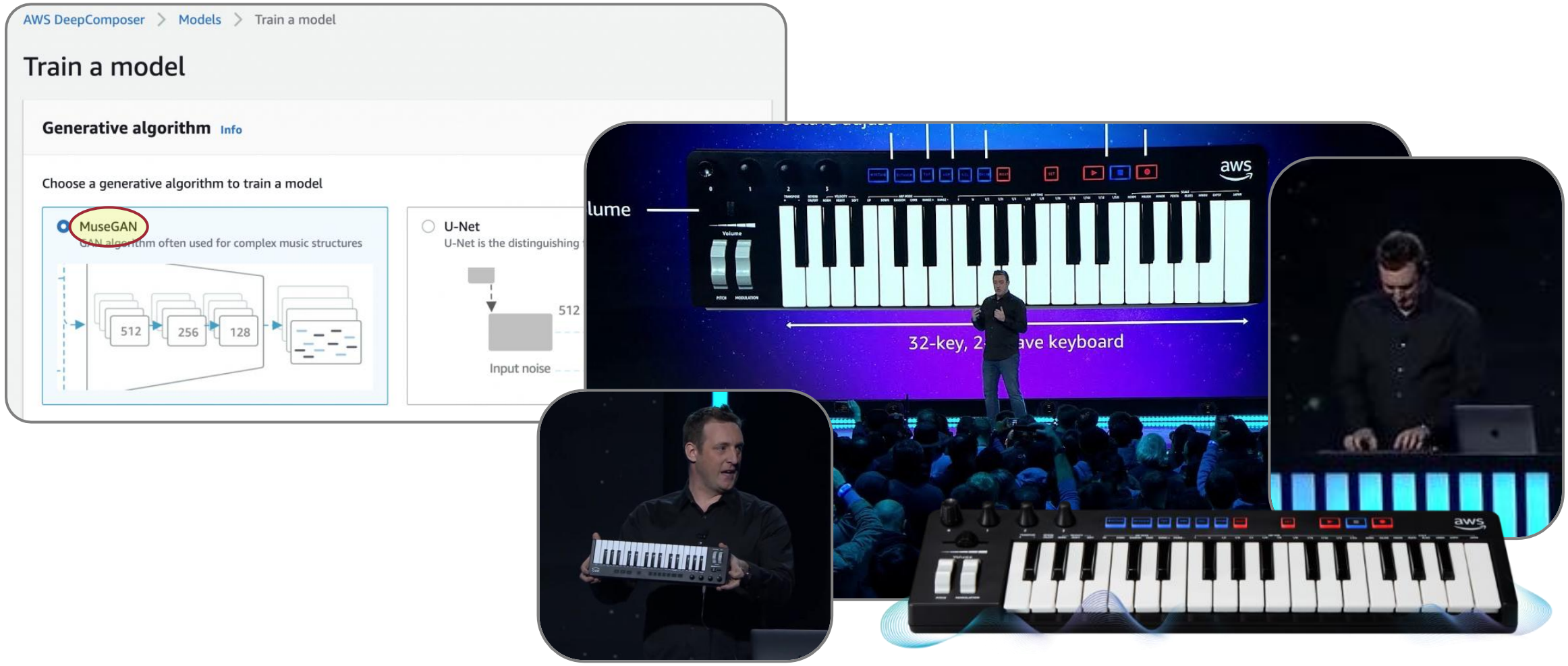






Hao-Wen Dong, Wen-Yi Hsiao, Li-Chia Yang, and Yi-Hsuan Yang, "MuseGAN: Multi-track Sequential Generative Adversarial Networks for Symbolic Music Generation and Accompaniment," *AAAI*, 2018.

# MuseGAN Features in AWS DeepComposer (2020)




amazon.com/dp/B07YGZ4V5B/

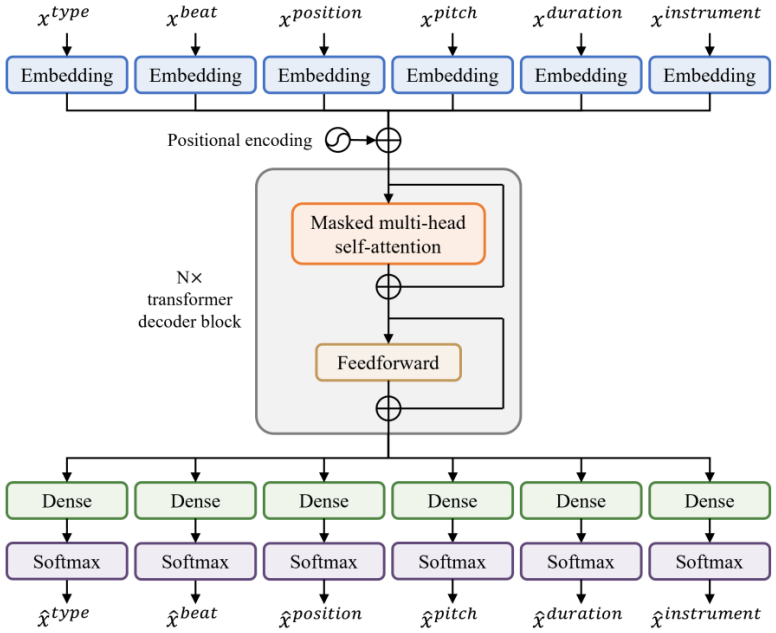
Julien Simon, "AWS DeepComposer – Now Generally Available With New Features," *AWS News Blog*, April 2, 2020.

# Generating Multitrack Music with Transformers (ICASSP 2023)

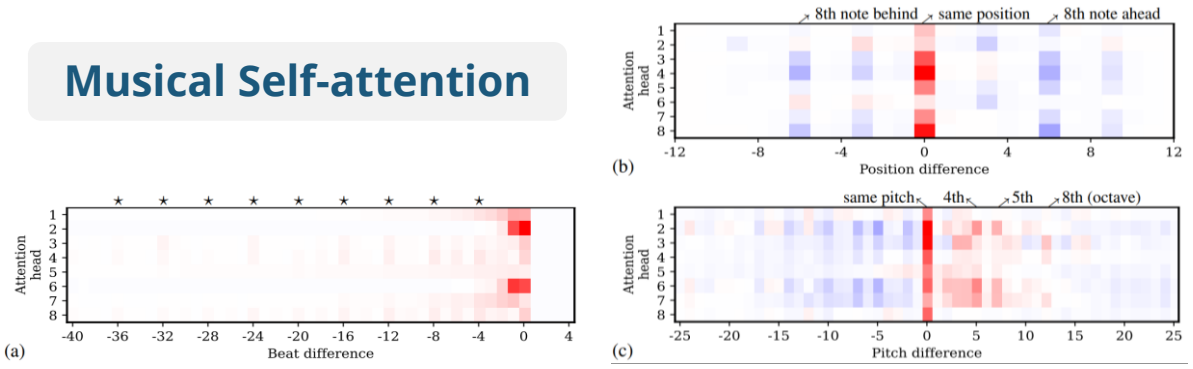
## Multitrack Music Representation

```
(0, 0,  0,  0,  0,  0)   Start of song
(1, 0,  0,  0,  0, 15)   Instrument: accordion
(1, 0,  0,  0,  0, 36)   Instrument: trombone
(1, 0,  0,  0,  0, 39)   Instrument: brasses
(2, 0,  0,  0,  0,  0)   Start of notes
(3, 1,  1, 41, 15, 36)   Note: beat=1, position=1,  pitch=E2, duration=48, instrument=trombone
(3, 1,  1, 65,  4, 39)   Note: beat=1, position=1,  pitch=E4, duration=12, instrument=brasses
(3, 1,  1, 65, 17, 15)   Note: beat=1, position=1,  pitch=E4, duration=72, instrument=accordion
(3, 1,  1, 68,  4, 39)   Note: beat=1, position=1,  pitch=G4, duration=12, instrument=brasses
(3, 1,  1, 68, 17, 15)   Note: beat=1, position=1,  pitch=G4, duration=72, instrument=accordion
(3, 1,  1, 73, 17, 15)   Note: beat=1, position=1,  pitch=C5, duration=72, instrument=accordion
(3, 1, 13, 68,  4, 39)   Note: beat=1, position=13, pitch=G4, duration=12, instrument=brasses
(3, 1, 13, 73,  4, 39)   Note: beat=1, position=13, pitch=C5, duration=12, instrument=brasses
(3, 2,  1, 73, 12, 39)   Note: beat=2, position=1,  pitch=C5, duration=36, instrument=brasses
(3, 2,  1, 77, 12, 39)   Note: beat=2, position=1,  pitch=E5, duration=36, instrument=brasses
        ...              ...
(4, 0,  0,  0,  0,  0)   End of song
```

## Multitrack Music Transformer



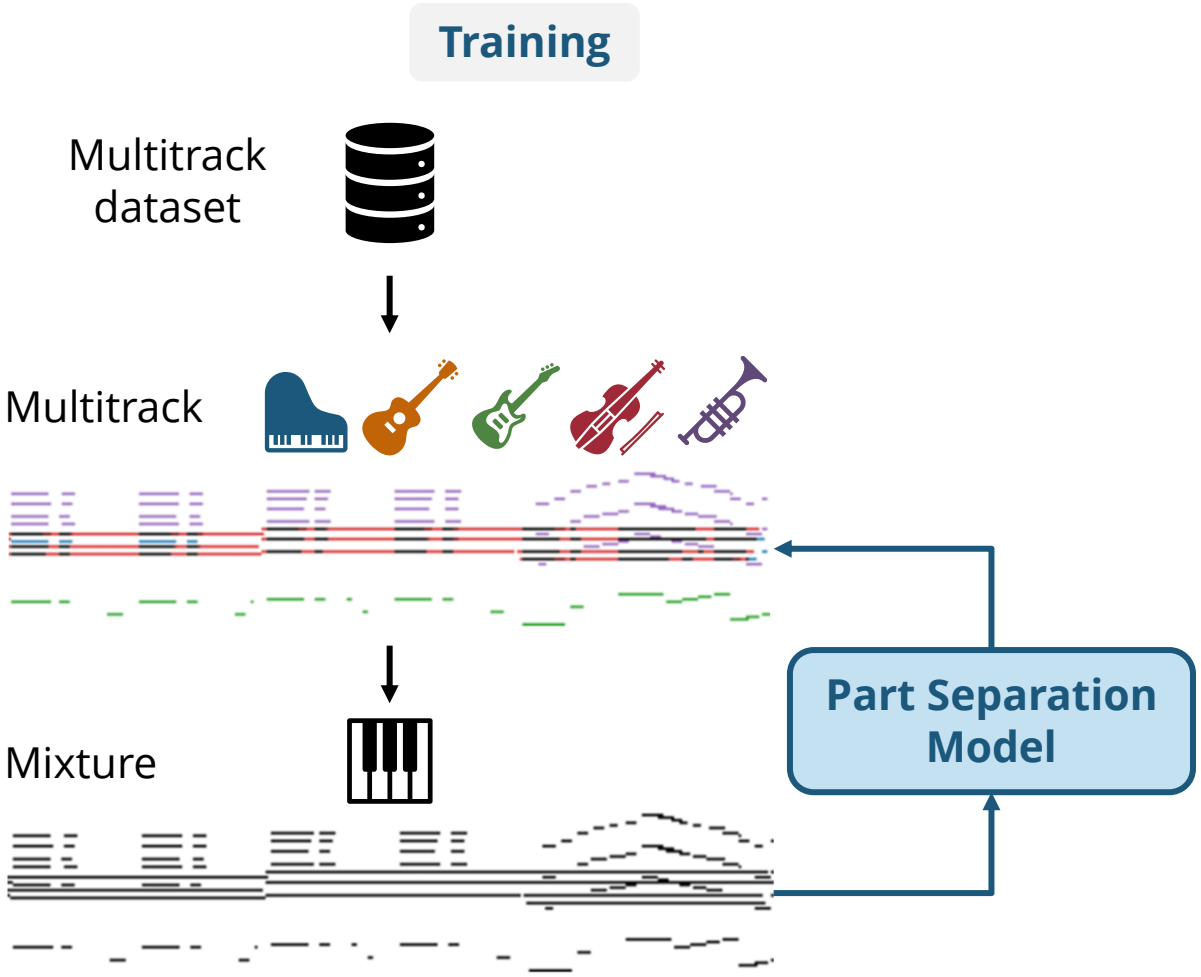

## Musical Self-attention

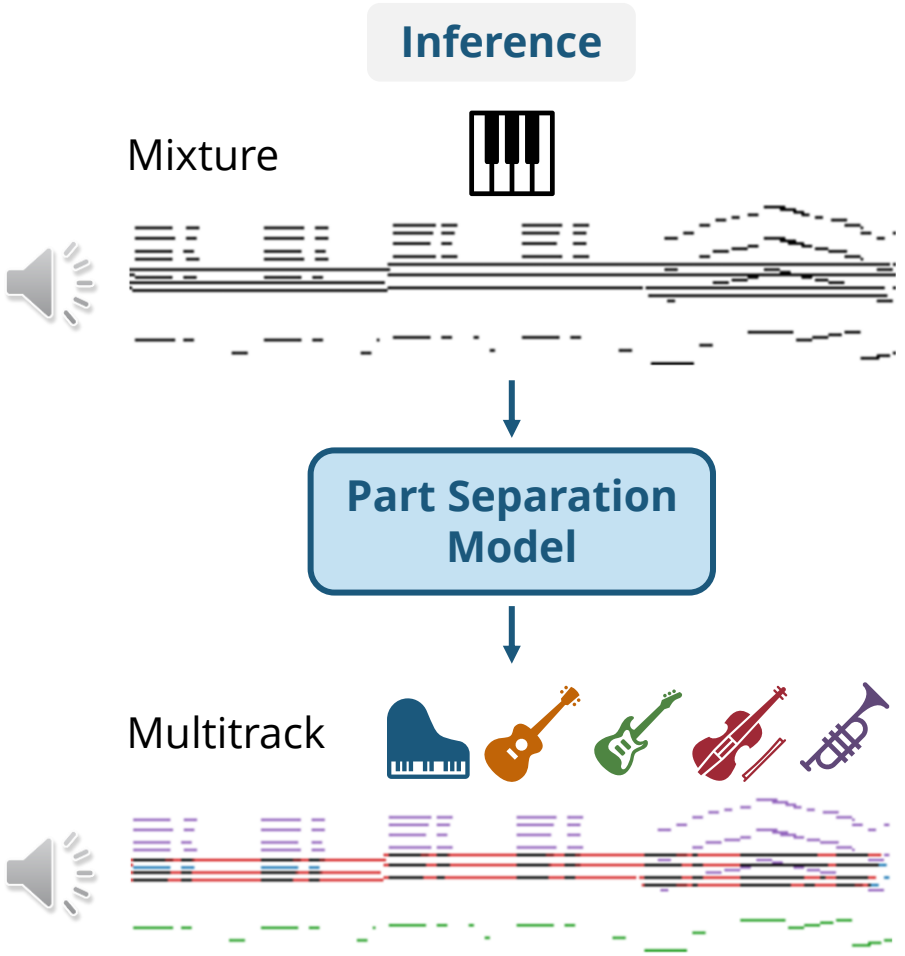



UC San Diego

# Automatic Instrumentation (**ISMIR 2021**)

Stanford UC San Diego

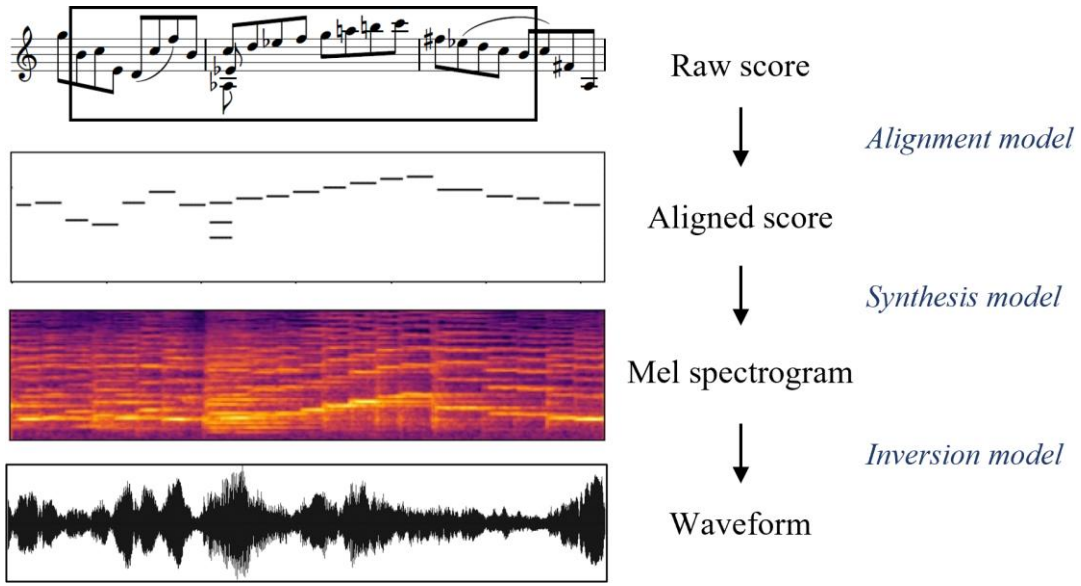


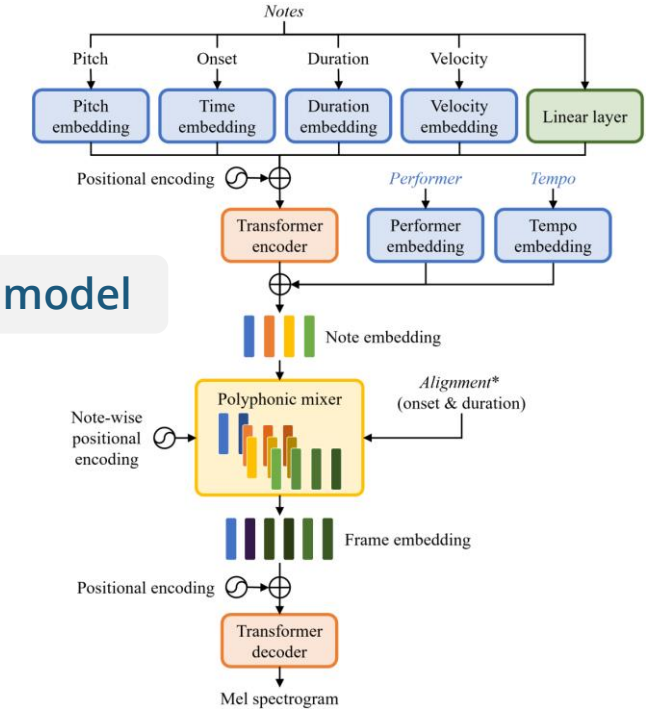

Hao-Wen Dong, Chris Donahue, Taylor Berg-Kirkpatrick and Julian McAuley, "Towards Automatic Instrumentation by Learning to Separate Parts in Symbolic Multitrack Music," *ISMIR*, 2021.

# Synthesizing Expressive Violin Performance (**ICASSP 2022**)

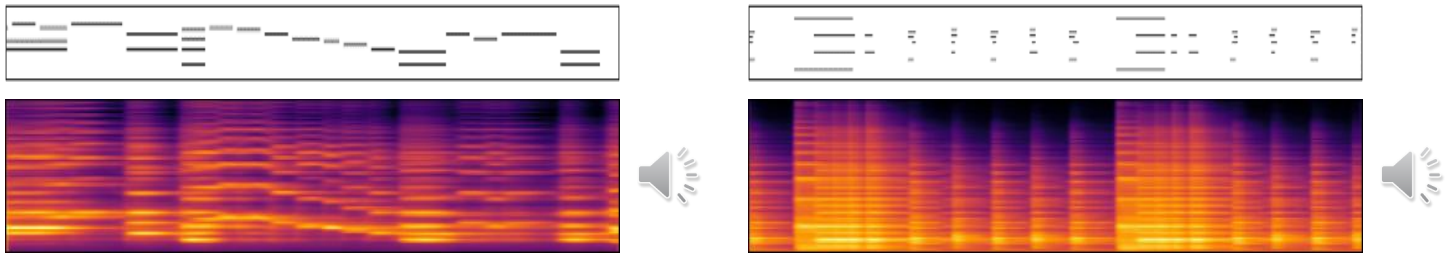
## Performance synthesis




## TTS-based model




## Example results

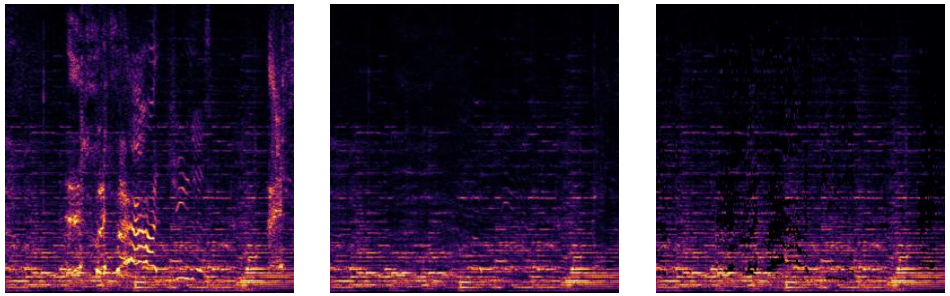


Dolby UC San Diego

# Text-queried Sound Separation (**ICLR 2023**)

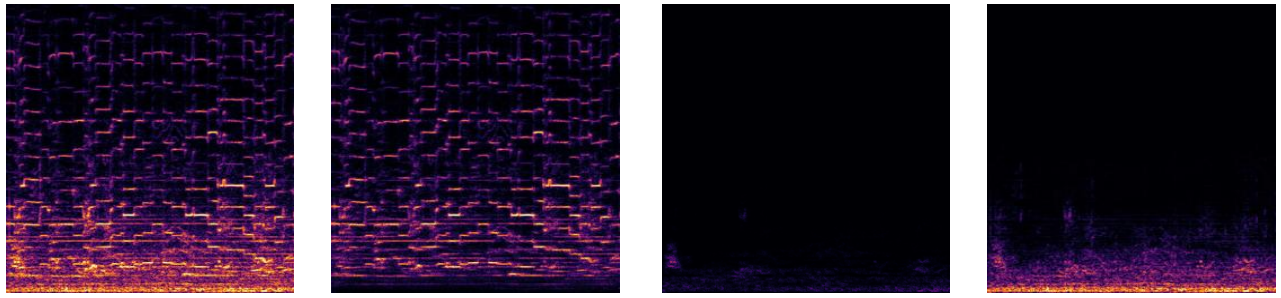
**Query: "*playing harpsichord*"**

**Mixture** **Prediction** **Ground truth**



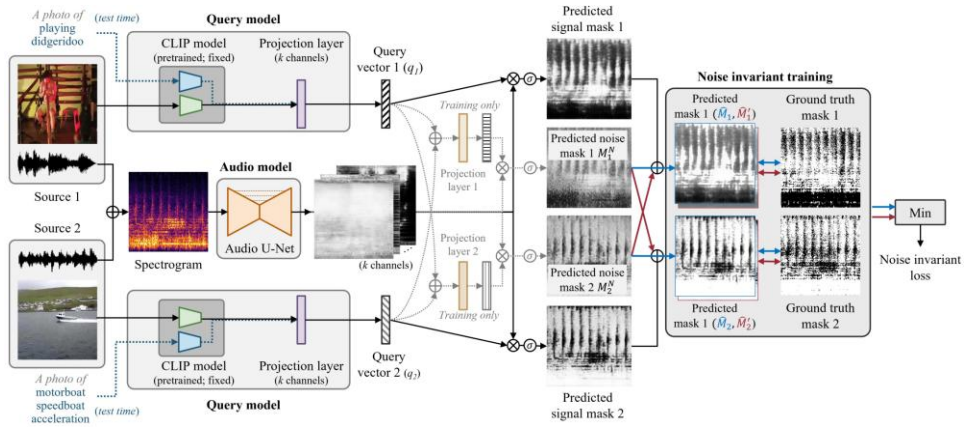
**Query: "*playing bagpipe*"**

**Mixture** **Prediction** **Noise head 1** **Noise head 2**



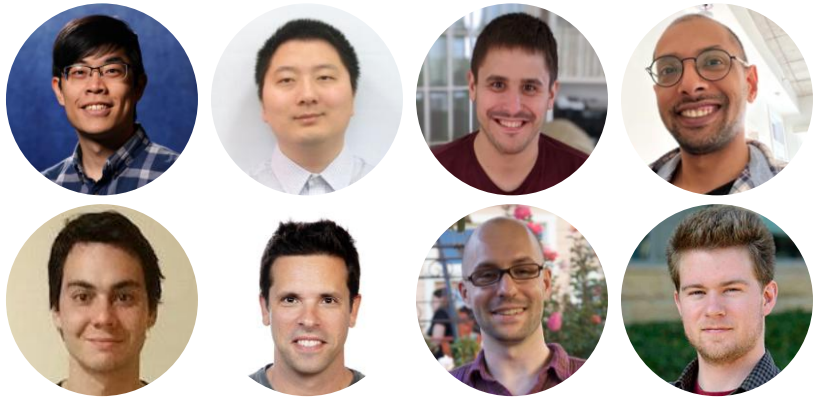
SONY UC San Diego

**Text-queried sound separation model**



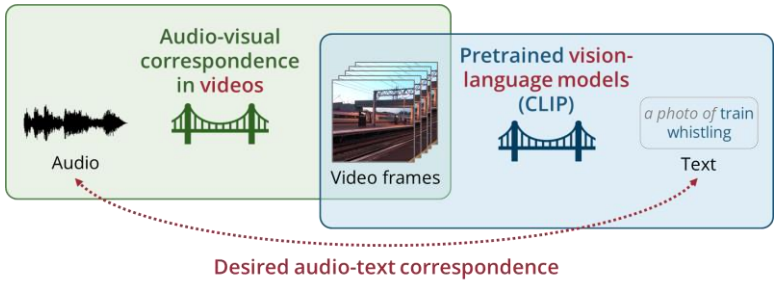

Hao-Wen Dong, Naoya Takahashi, Yuki Mitsufuji, Julian McAuley, and Taylor Berg-Kirkpatrick, "CLIPSep: Learning Text-queried Sound Separation with Noisy Unlabeled Videos," *ICLR*, 2023.

# Text-to-Audio Synthesis (**WASPAA 2023**)

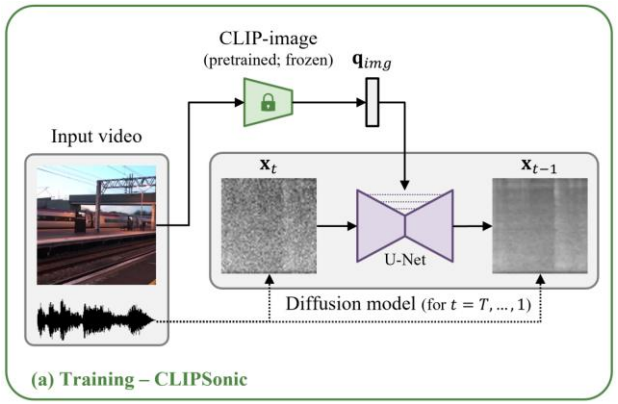


Dolby UC San Diego

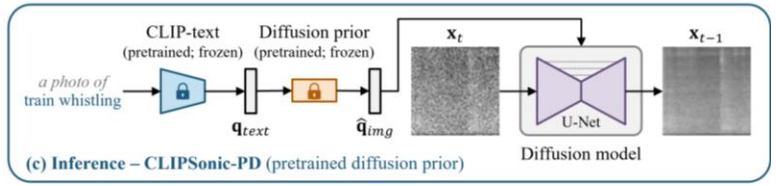
## Learning Sounds from Noisy Videos




## Training




## Inference




## Image-to-sound results

## Text-to-sound results


Hao-Wen Dong, Xiaoyu Liu, Jordi Pons, Gautam Bhattacharya, Santiago Pascual, Joan Serrà, Taylor Berg-Kirkpatrick, and Julian McAuley, "CLIPSonic: Text-to-Audio Synthesis with Unlabeled Videos and Pretrained Language-Vision Models," *WASPAA*, 2023.

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# Video Editing

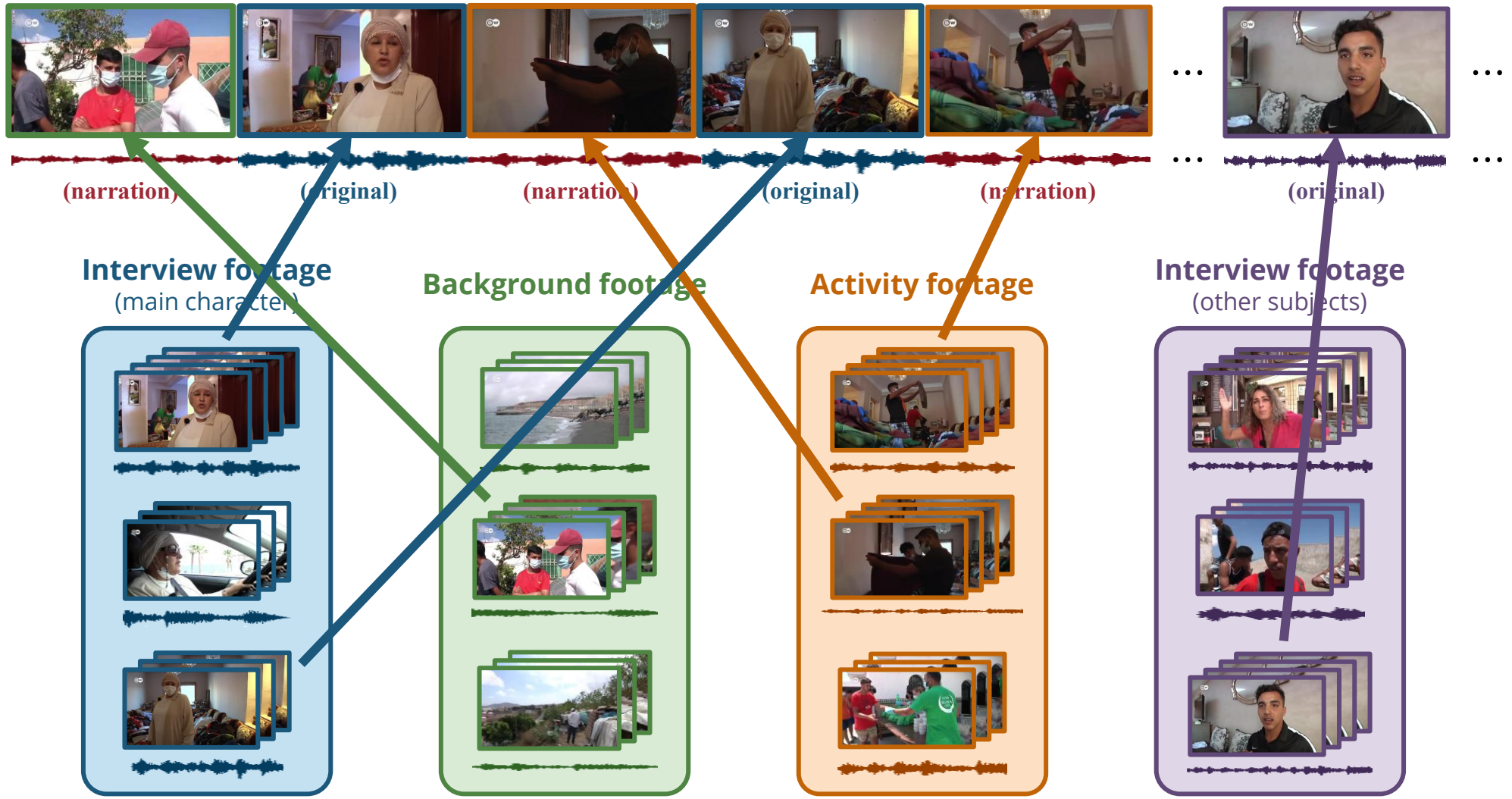

**Interview footage**
(main character)

**Background footage**

**Activity footage**

**Interview footage**
(other subjects)

# Video Editing



# Fast-growing Short Video Platforms

YouTube Shorts

Instagram

vimeo

niconico

TikTok

DAILYMOTION

bilibili

twitch

**For content creators, help promote their long video contents**

**For content consumers, help digest information in a more engaging way**

ICLR

# TeaserGen: Generating Teasers for Long Documentaries

Weihan Xu[1] Paul Pu Liang[2] Haven Kim[3]
Julian McAuley[3] Taylor Berg-Kirkpatrick[3] **Hao-Wen Dong**[4]

[1] Duke University [2] MIT [3] UC San Diego [4] University of Michigan



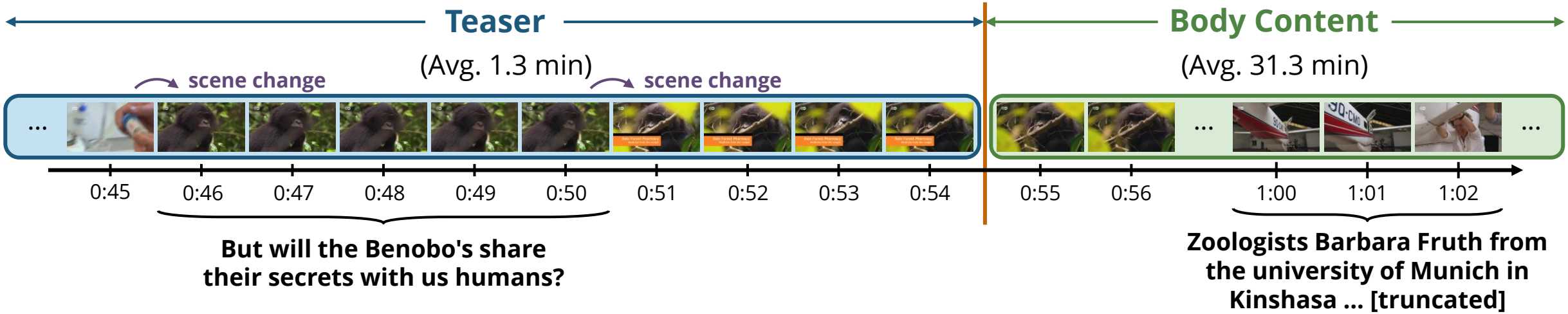



Duke UNIVERSITY Massachusetts Institute of Technology UC San Diego UNIVERSITY OF MICHIGAN

# Documentary Teaser Generation

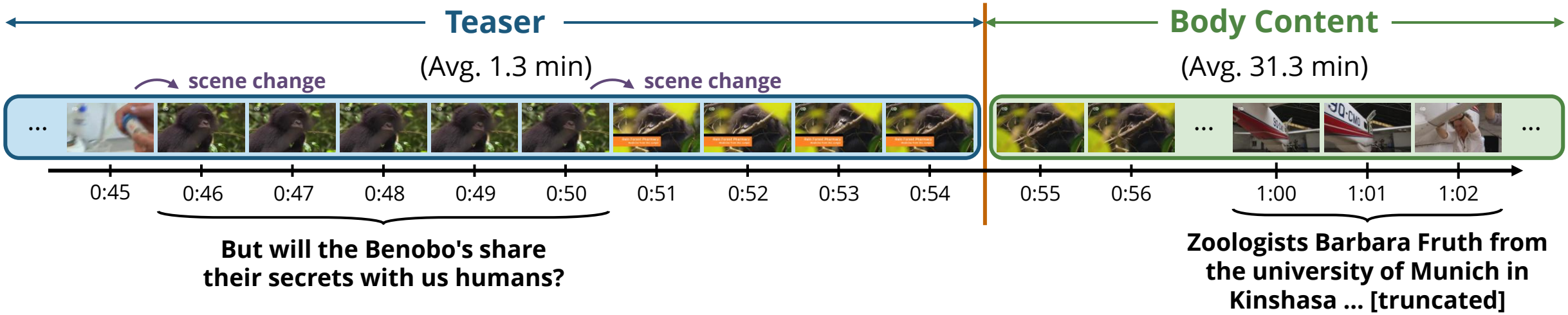
- Unlike **video highlight detection**, a teaser **needs a cohesive narrative**
- Unlike **video summarization**, a teaser **needs to be interesting and engaging**
- Unlike a **movie trailer**, a documentary teaser is more **narration-focused**
- A documentary teaser **needs to preserve the factual accuracy**

# DocumentaryNet: A New Documentary Dataset

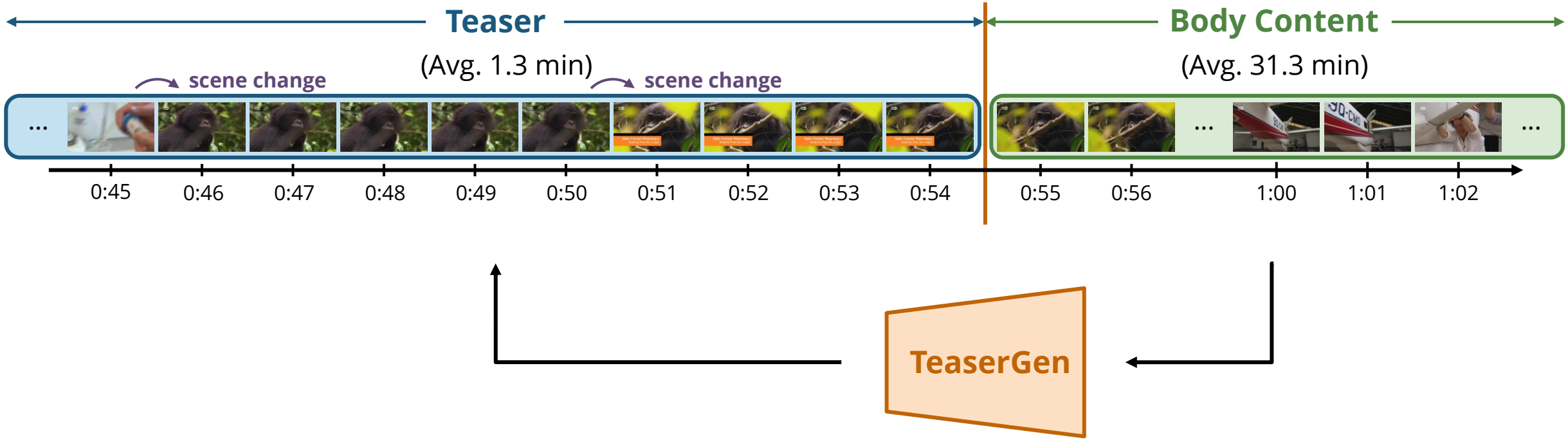



# DocumentaryNet: A New Documentary Dataset


- **1,269** high-quality documentaries paired with **teasers**
- **689 hours** in total
- Three reputable sources: **DW**, **PBS**, **National Geographic**

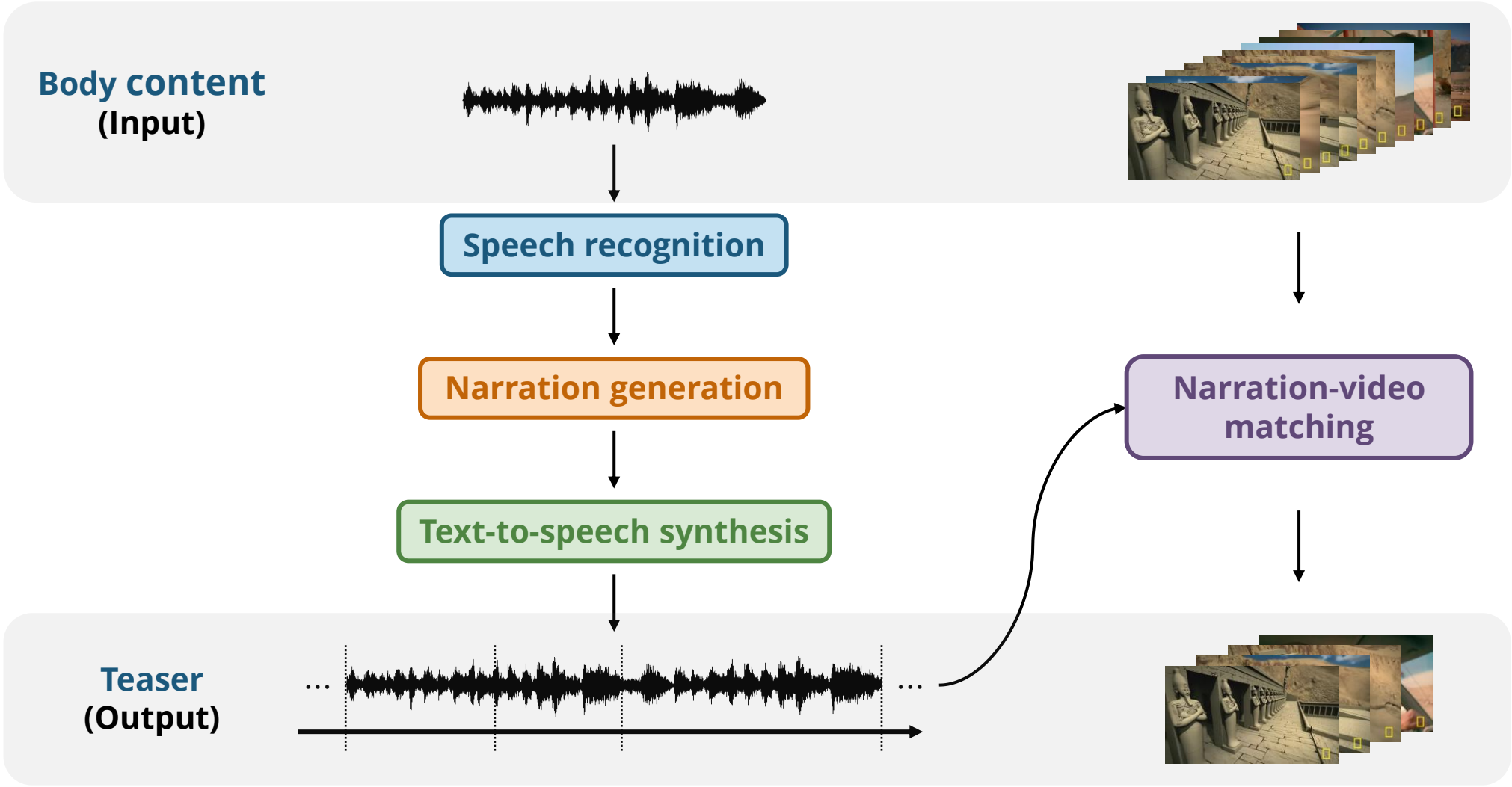


# Generating Teasers from Long Documentaries

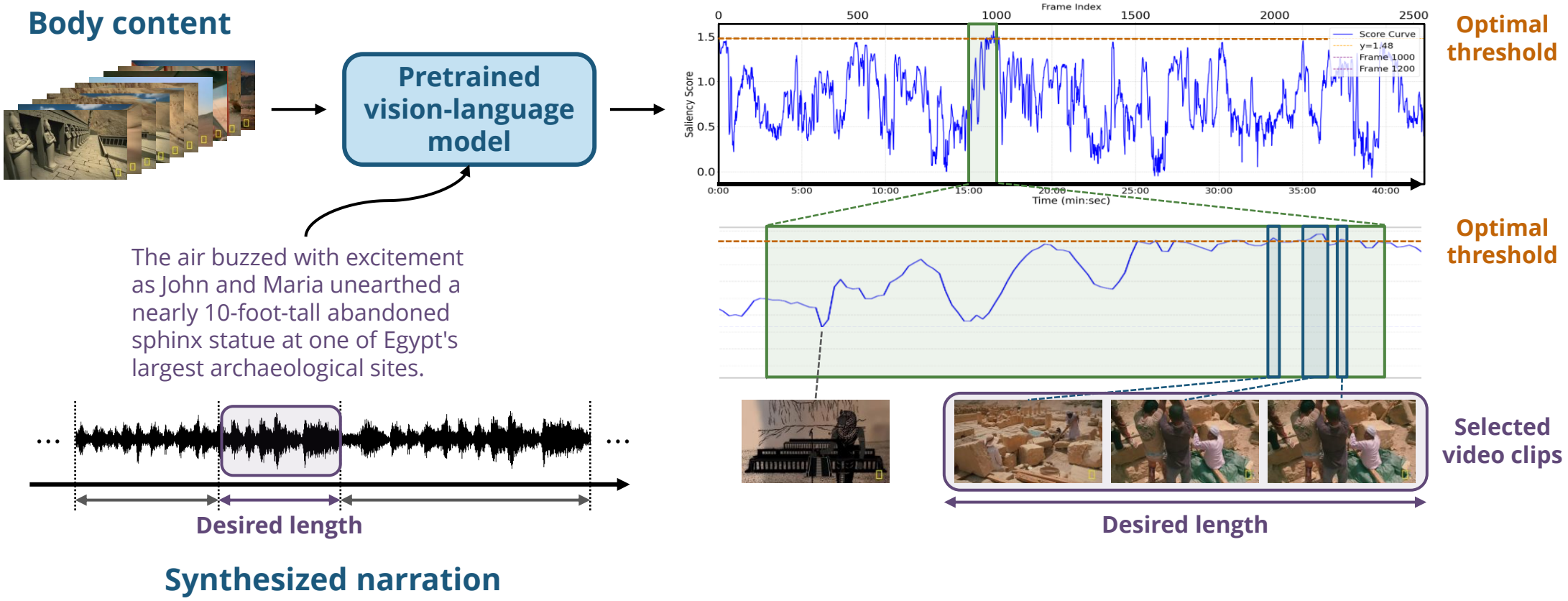



**~24:1 compression ratio**

# Narration-Centered Long-to-Short Video Editing

# Finding Accompanying Visuals for Narrations

# Example Results


## Ground truth

| | | |
|---|---|---|
| 1 |  | Egypt, the richest source of archaeological treasures on the planet |
| 2 |  | Beneath this desert landscape, why the secrets of this ancient civilization? |
| 3 |  | Wow! You can see why a Pharaoh's chosen place |
| 4 |  | for a full season of excavations |
| 5 |  | our cameras have unprecedented access, follow teams on the front line of archaeology. |
| 6 |  | I'm driving so fast because I'm excited! |
| 7 |  | It's an entrance, we can see an entrance. |
| 8 |  | I have just been told that they have found something |
| 9 |  | Revealing varied secrets. |
| 10 |  | Making discoveries, they could rewrite ancient history. |
| 11 |  | This time, new secrets about one of Egypt's greatest rulers the Pharaoh Queen, Hatshepsut |
| 12 |  | Doctor Ranski discovers very treasures that her magnificent temple had reached was to be remembered for millions of years. |
| 13 |  | For my beloved daughter, not son, and John and Maria, honor a rare and intriguing statue. |

## TeaserGen-PT

| | | |
|---|---|---|
| 1 |  | Under the scorching Egyptian sun, Dr. Zbigniew Szybranski led a team of archaeologists in Luxor, meticulously excavating the unique temple of the revolutionary female pharaoh Hetshepsood. |
| 2 |  | The air buzzed with excitement as John and Maria unearthed a nearly 10-foot-tall abandoned sphinx statue at one of Egypt's largest archaeological sites. |
| 3 |  | Meanwhile, in Aswan, Martina Bartanova's team stumbled upon ancient human remains that could halt their exploration of an unopened tomb. |
| 4 |  | The discovery of a child's remains and a miniature sphinx added layers of mystery to their quest. |
| 5 |  | At Karnak Temple, John and Maria delved into inscriptions revealing Hetshepsood's portrayal as a male pharaoh, while Yale professors used digital technology to study ancient texts. |
| 6 |  | In Dra'abu El Naga, another team meticulously organized fragmented human remains, uncovering stories of women in ancient Egyptian society. |
| 7 |  | American archaeologist Susanne Onstein explored the monumental building campaigns of Hetshepsood, whose colossal obelisks stood as testaments to her reign. |
| 8 |  | Amidst pottery fragments and evidence of temples built by Hetshepsood and her stepson Tutmose III, the archaeologists faced personal reflections and challenges. |
| 9 |  | The winds of history whispered through the sands, as each discovery brought them closer to unraveling the enigmatic legacy of Pharaoh Queen Hetshepsood. |
| 10 |  | How do the discoveries and restoration efforts at Hatshepsut's temple and other archaeological sites in Egypt contribute to our understanding of her reign and the broader role of women in ancient Egyptian society? |

## TeaserGen-LR

| | | |
|---|---|---|
| 1 |  | Under the scorching Egyptian sun, Dr. Zbigniew Szybranski led a team of archaeologists in Luxor, meticulously excavating the unique temple of the revolutionary female pharaoh Hetshepsood. |
| 2 |  | The air buzzed with excitement as John and Maria unearthed a nearly 10-foot-tall abandoned sphinx statue at one of Egypt's largest archaeological sites. |
| 3 |  | Meanwhile, in Aswan, Martina Bartanova's team stumbled upon ancient human remains that could halt their exploration of an unopened tomb. |
| 4 |  | The discovery of a child's remains and a miniature sphinx added layers of mystery to their quest. |
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| 10 |  | How do the discoveries and restoration efforts at Hatshepsut's temple and other archaeological sites in Egypt contribute to our understanding of her reign and the broader role of women in ancient Egyptian society? |

# Example: Egyptian History


**Title**: “Hatshepsut: Mysteries of the Warrior Pharaoh Queen (Full Episode) | Lost Treasures of Egypt”

wx83.github.io/TeaserGen_Official/

# Objective Evaluation


| | | | | Repetitiveness | | | Text-visual correspondence | |
|---|---|---|---|---|---|---|---|---|
| Model | Query | Decoding | DP | F1 (%)↑ | REP (%) | SCR (%) | CLIPScore | VTGHLS |
| **Baseline models** | | | | | | | | |
| Random | Random | - | - | 1.67 | 4.05 | 7.81 | 0.56 | 0.75 |
| CLIP-NN | Narration | Greedy | × | 0.11 | 92.73 | 8.29 | 0.69 | 0.79 |
| UniVTG (2023b) | Title | Rank | - | 1.82 | 0 | 89.68 | 0.58 | 1.01 |
| CLIP-it (2021b) | Narration | Rank | × | 1.24 | 0 | 99.39 | 0.56 | 0.61 |
| **Pretraining-based models** | | | | | | | | |
| TeaserGen-PT | Title | Thresholding | - | 1.85 | 0 | 13.16 | 0.56 | 1.02 |
| TeaserGen-PT | Narration | Thresholding | - | 1.07 | 21.38 | 22.58 | 0.58 | 1.45 |
| TeaserGen-PT-CLIP | Narration | Threshold | × | 1.31 | 27.23 | 24.10 | 0.58 | 0.74 |
| **Learning-based models** | | | | | | | | |
| TeaserGen-LR | Narration | Greedy | × | 1.56 | 31.97 | 27.18 | 0.58 | 0.74 |
| TeaserGen-LR | Narration | Greedy | ✓ | 1.38 | 26.83 | 35.48 | 0.62 | 0.78 |
| TeaserGen-LR | Narration | Beam search | × | **1.88** | 24.16 | 41.97 | 0.58 | 0.74 |
| TeaserGen-LR | Narration | Beam Search | ✓ | **1.88** | 19.39 | 46.56 | 0.63 | 0.77 |
| Ground truth | - | - | - | 100 | >7.86 | 27.6 | 0.58 | 0.64 |

Scene change rate

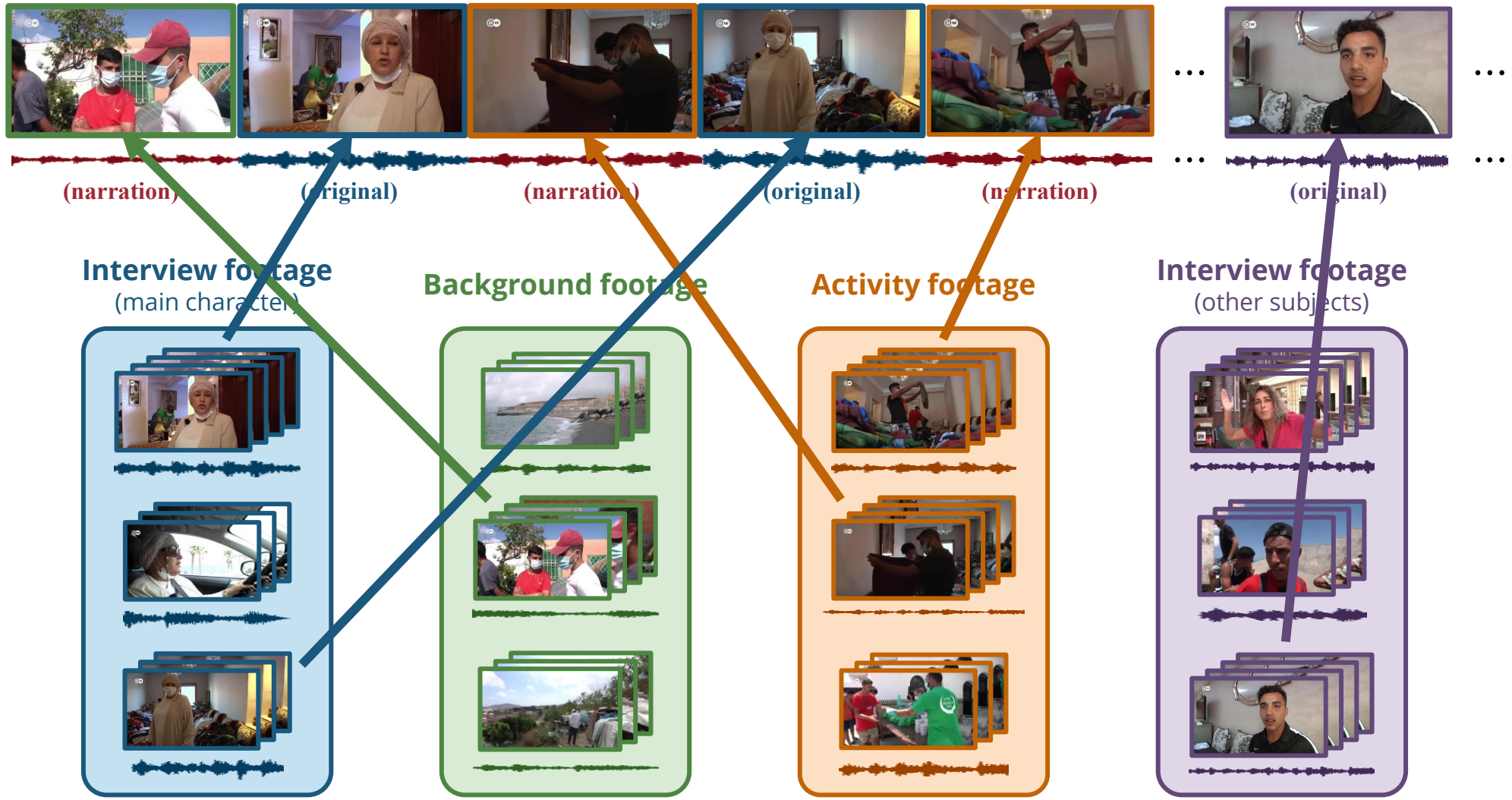
**Check out our paper for more results!**

# Subjective Evaluation


| Model | Query | Decoding | Coherence↑ | Alignment↑ | Engagingness↑ | Realness↑ |
|---|---|---|---|---|---|---|
| UniVTG (2023b) | Title | Rank | $2.61 \pm 0.50$ | $2.62 \pm 0.47$ | $2.67 \pm 0.57$ | $2.66 \pm 0.54$ |
| CLIP-it (2021b) | Narration | Rank | $2.61 \pm 0.46$ | $2.67 \pm 0.44$ | $2.57 \pm 0.46$ | $2.51 \pm 0.46$ |
| TeaserGen-PT | Title | Threshold | $\mathbf{3.14 \pm 0.50}$ | $2.84 \pm 0.57$ | $\mathbf{2.81 \pm 0.49}$ | $\mathbf{2.94 \pm 0.50}$ |
| TeaserGen-LR | Narration | Greedy | $2.90 \pm 0.45$ | $\mathbf{2.88 \pm 0.48}$ | $2.71 \pm 0.42$ | $2.71 \pm 0.44$ |
| TeaserGen-LR | Narration | Beam search | $2.84 \pm 0.46$ | $2.69 \pm 0.51$ | $2.71 \pm 0.42$ | $2.64 \pm 0.41$ |

**TeaserGen-PT (interval-based) is more effective at identifying relevant visual content than TeaserGen-LR (learning-based)**

# Video Editing



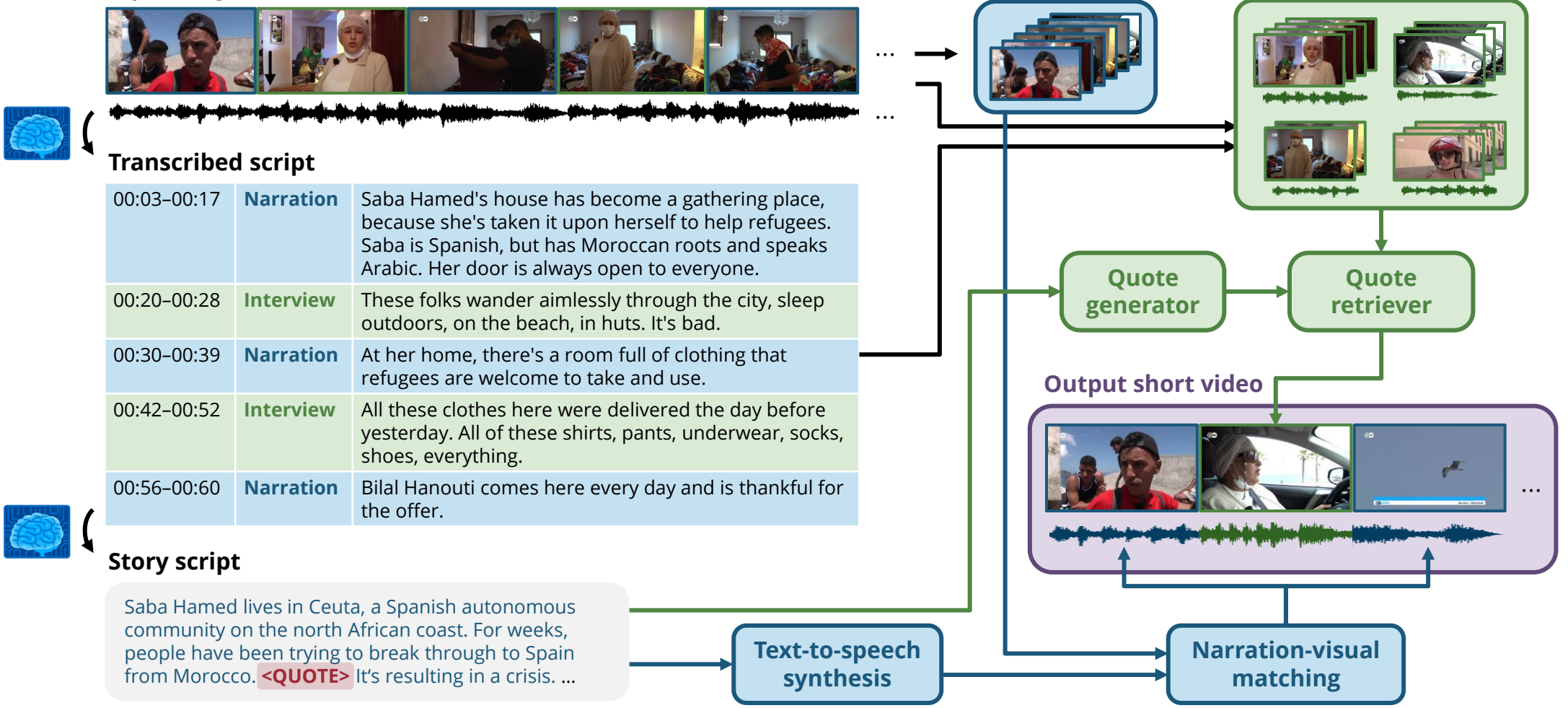

# REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing

Weihan Xu[1] Yimeng Ma[1] Jingyue Huang[2] Yang Li[1] Weyne Ma[3]
Taylor Berg-Kirkpatrick[2] Julian McAuley[2] Paul Pu Liang[2] **Hao-Wen Dong**[4]

[1] Duke University [2] UC San Diego [3] MBZUAI [4] MIT [5] University of Michigan

Duke UNIVERSITY UC San Diego MOHAMED BIN ZAYED UNIVERSITY OF ARTIFICIAL INTELLIGENCE Massachusetts Institute of Technology UNIVERSITY OF MICHIGAN

# Learning to *Quote* a Video




Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

# Learning to *Quote* a Video

**REGen-DQ**
**(direct quote)**

Quote

$$\ldots, x_i, \langle \text{SOQ} \rangle, y_1, \ldots, y_n, \langle \text{EOQ} \rangle, x_{i+1}, \ldots$$

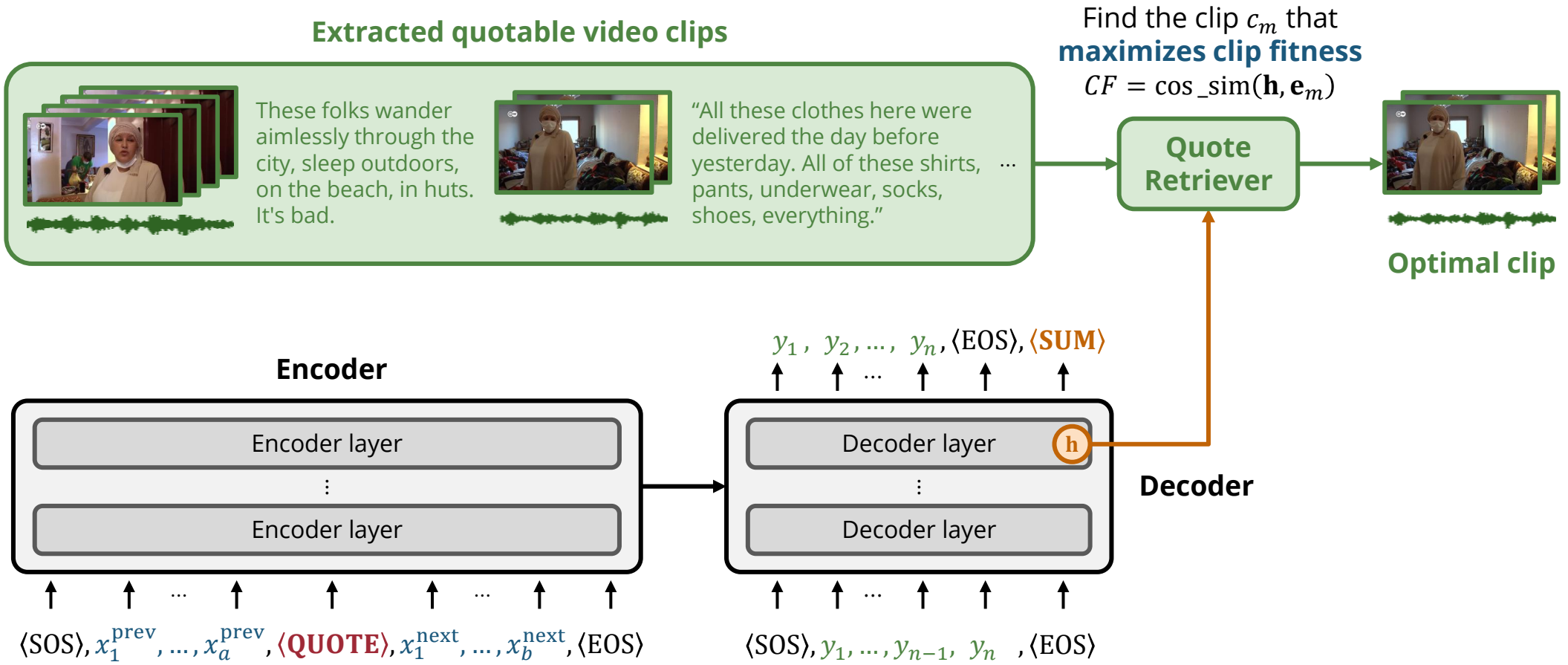
**REGen-IDQ**
**(indirect quote)**

$$\ldots, x_i, \langle \text{QUOTE} \rangle, x_{i+1}, \ldots$$

**To be retrieved later!**

Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

# Retrieving a Video Quote




Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

# Measuring Clip Fitness

For a candidate clip $c_m$, the **clip fitness** is defined as

$$CF := \cos\_\text{sim}(\mathbf{h}, \mathbf{e}_m)$$

**REGen-IDQ-T**
**(text only)**

$$\mathbf{e}_m = \mathbf{e}_m^{\text{text}}$$

**REGen-IDQ-TV**
**(text+video)**

$$\mathbf{e}_m = f\left(\text{concat}\left(\mathbf{e}_m^{\text{text}}, \mathbf{e}_m^{\text{img}}\right)\right)$$

**Learnable mapping**

Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

# Comparing Quote Retrieval Methods

| Retriever | Similarity measure | Recall@1 (%) | Recall@5 (%) | Recall@10 (%) | Insertion effectiveness |
|---|---|---|---|---|---|
| Random | - | $0.00 \pm 0.00$ | $0.28 \pm 0.48$ | $7.22 \pm 5.54$ | $3.08 \pm 0.25$ |
| GPT-4o infilling | Text only | $2.78 \pm 0.48$ | $13.89 \pm 1.27$ | $22.50 \pm 1.44$ | $2.48 \pm 0.31$ |
| QuoteRetriever-T | Text only | **5.00** | **17.50** | **30.00** | **$3.56 \pm 0.22$** |
| QuoteRetriever-TV | Text+Visual | **5.00** | 15.00 | 23.33 | $3.49 \pm 0.26$ |

**Retrieving with only text is better than retrieving with both text and video**

Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

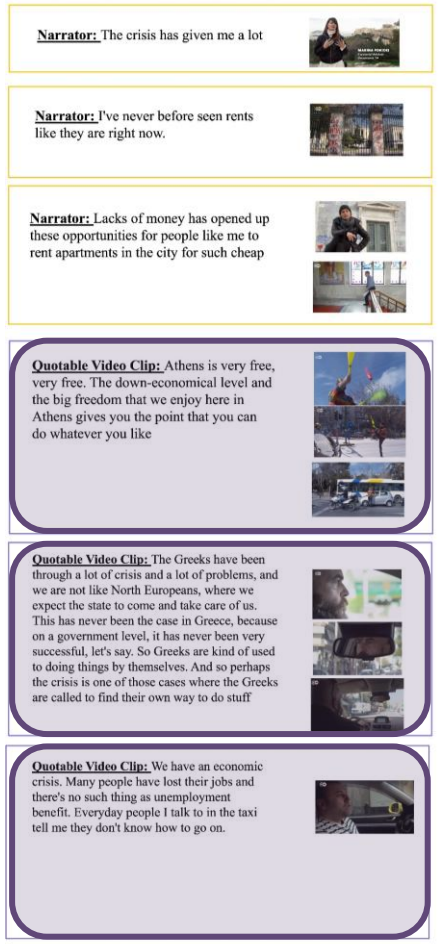
# Example: Modern Art Exhibition

**Title**: “documenta 14 - learning from Athens | DW Documentary”

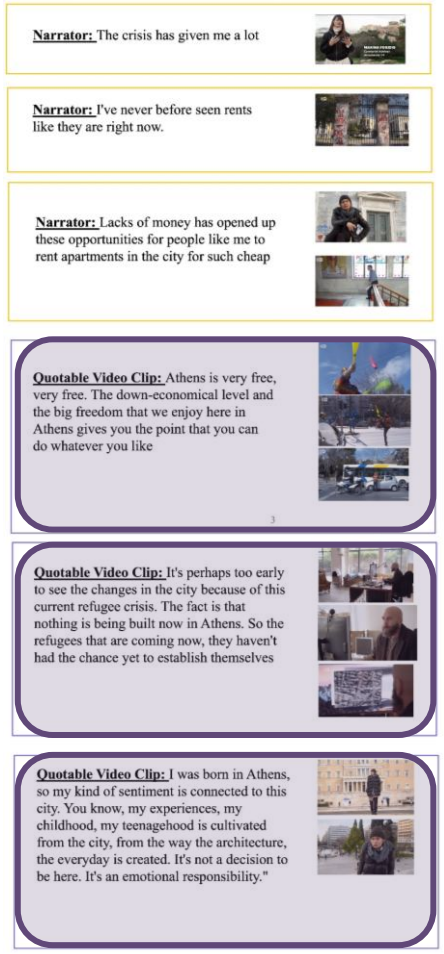

youtu.be/agij_lxGjCI

# Example Results

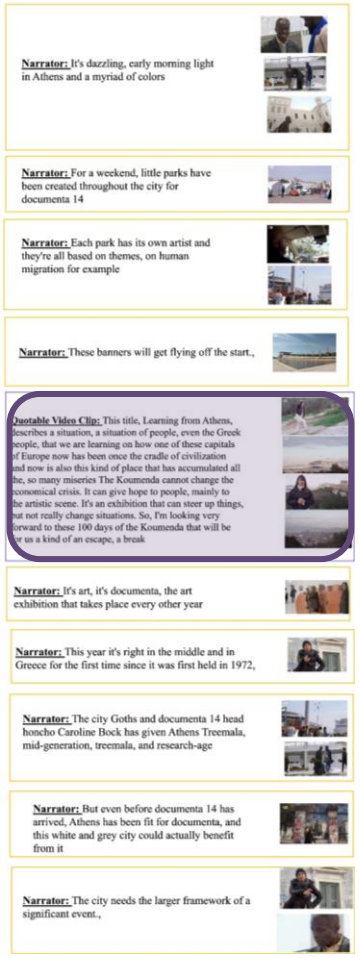
## REGen-IDQ-TV




## REGen-IDQ-T




## REGen-DQ




Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

# Objective Evaluation

**Repetitiveness**

| Model | Dur (sec) | Interview ratio (%) | F1 (%) | SCR (%) | REP (%) | VTGHLS | CLIPS-I | CLIPS-N |
|---|---|---|---|---|---|---|---|---|
| Random extraction | 101 | 56 ± 20 | 1.10 | 20.71 | 0.41 | 0.83 | 0.55 | 0.62 |
| ETS | 142 | 34 ± 16 | 1.92 | 13.65 | 4.49 | 1.06 | 0.64 | 0.60 |
| A2Summ [4] | 73 | 42 ± 25 | 1.70 | 14.20 | 1.73 | 0.89 | 0.56 | 0.63 |
| TeaserGen [11] | 155 | - | 1.64 | **22.61** | 21.38 | 0.80 | - | 0.67 |
| GPT-4o-DQ | 151 | 42 ± 42 | 1.56 | 16.55 | 20.75 | 1.01 | 0.58 | 0.42 |
| GPT-4o-SP-DQ | 619 | 61 ± 17 | **2.07** | 12.38 | 18.33 | 1.02 | 0.62 | 0.62 |
| REGen-DQ | 95 | 37 ± 26 | 1.45 | 19.13 | 10.35 | 1.05 | 0.48 | 0.57 |
| REGen-IDQ-T | 77 | 35 ± 31 | 1.89 | 19.79 | 10.02 | 1.03 | **0.41** | **0.57** |
| REGen-IDQ-TV | 81 | 35 ± 31 | 1.90 | 19.86 | **9.70** | 1.02 | 0.39 | 0.57 |
| Ground truth | 76 | 54 ± 37 | 69.00* | 27.60 | > 7.86 | <0.98 | 0.43 | 0.57 |

**Scene change rate** **Text-visual correspondence**

**Check out our paper for more results!**

Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

# Subjective Evaluation

| Model | Coherence↑ | Alignment↑ | Realness↑ | Interview effectiveness↑ |
|---|---|---|---|---|
| A2Summ [4] | $2.72 \pm 0.24$ | $2.87 \pm 0.26$ | $2.67 \pm 0.23$ | $3.07 \pm 0.24$ |
| TeaserGen [11] | $3.22 \pm 0.23$ | $2.92 \pm 0.24$ | $2.86 \pm 0.23$ | - |
| GPT-4o-SP-DQ | $3.08 \pm 0.24$ | $3.23 \pm 0.25$ | $2.81 \pm 0.25$ | $3.32 \pm 0.25$ |
| REGen-DQ | $2.97 \pm 0.27$ | $3.03 \pm 0.27$ | $2.75 \pm 0.30$ | $\mathbf{3.33 \pm 0.29}$ |
| REGen-IDQ-TV | $\mathbf{3.29 \pm 0.24}$ | $\mathbf{3.30 \pm 0.26}$ | $\mathbf{3.05 \pm 0.25}$ | $3.25 \pm 0.30$ |

**REGen-IDQ-TV (indirect quote-based) outperforms REGen-DQ in most criteria**

Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

# Limitations

- Assumed that **narration plays a more significant role** than visuals
  - This assumption might not hold for movies and vlogs

- Risks of **misplacing a quote in a wrong context**
  - Grounding the script generation model with information about all quotable materials
  - May also be alleviated by context-aware video embeddings

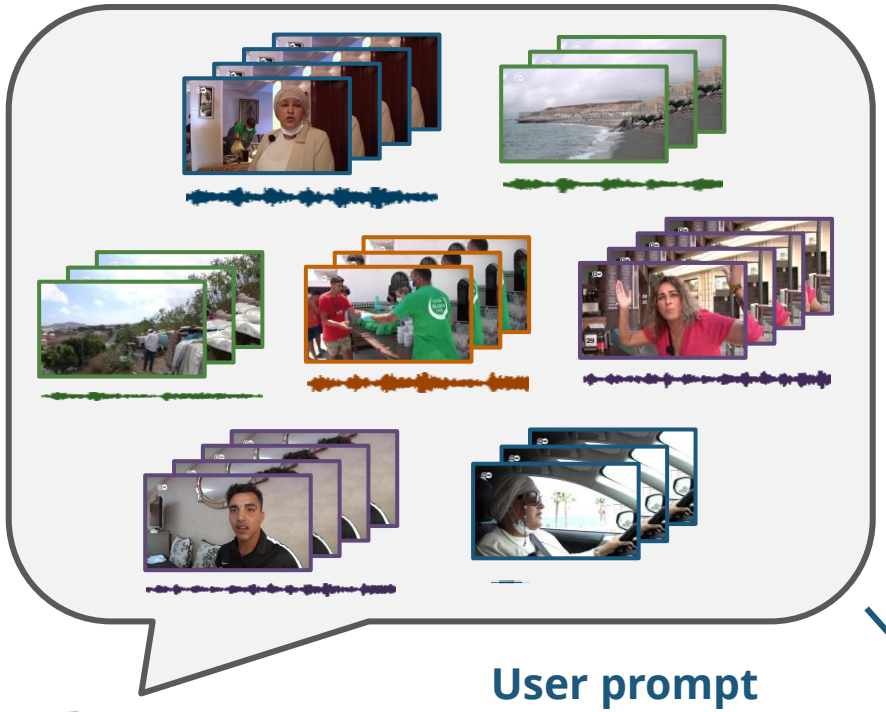
- Reliance on successful **scene segmentation** of the input video
  - Speaker diarization might not do the trick for lecture recordings

Weihan Xu, Yimeng Ma, Jingyue Huang, Yang Li, Wenye Ma, Taylor Berg-Kirkpatrick, Julian McAuley, Paul Pu Liang, and Hao-Wen Dong, "REGen: Multimodal Retrieval-Embedded Generation for Long-to-Short Video Editing," *arXiv preprint arXiv:2505.18880*, 2025.

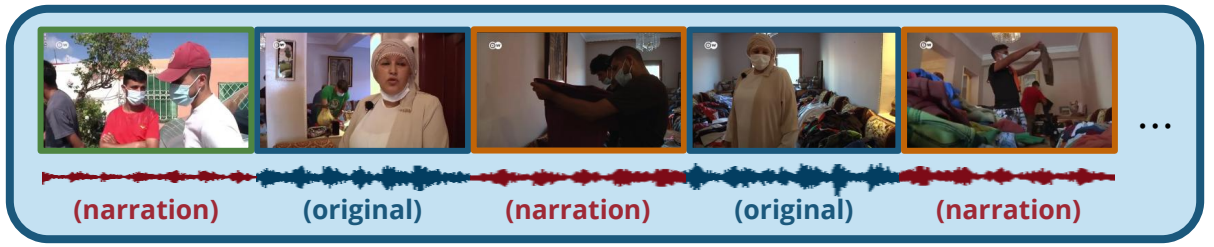
# Towards AI-assisted Video Editing

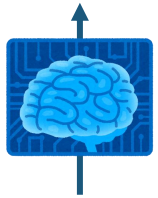
# Future Work: Multimodal RAG-based Video Editing

**Raw video materials**



**Output video**



**Video retriever**

**Editable video script**

| | | |
|---|---|---|
| 00:03 – 00:17 | Narration | Saba Hamed's house has become a gathering place, because she's taken it upon herself to help refugees. Saba is Spanish, but has Moroccan roots and speaks Arabic. Her door is always open to everyone. |
| 00:20 – 00:28 | Interview | *"These folks wander aimlessly through the city, sleep outdoors, on the beach, in huts. It's bad."* |
| 00:30 – 00:39 | Narration | At her home, there's a room full of clothing that refugees are welcome to take and use. |
| 00:42 – 00:52 | Interview | *"All these clothes here were delivered the day before yesterday. All of these shirts, pants, underwear, socks, shoes, everything."* |
| 00:56 – 00:60 | Narration | Bilal Hanouti comes here every day and is thankful for the offer. |

⋮

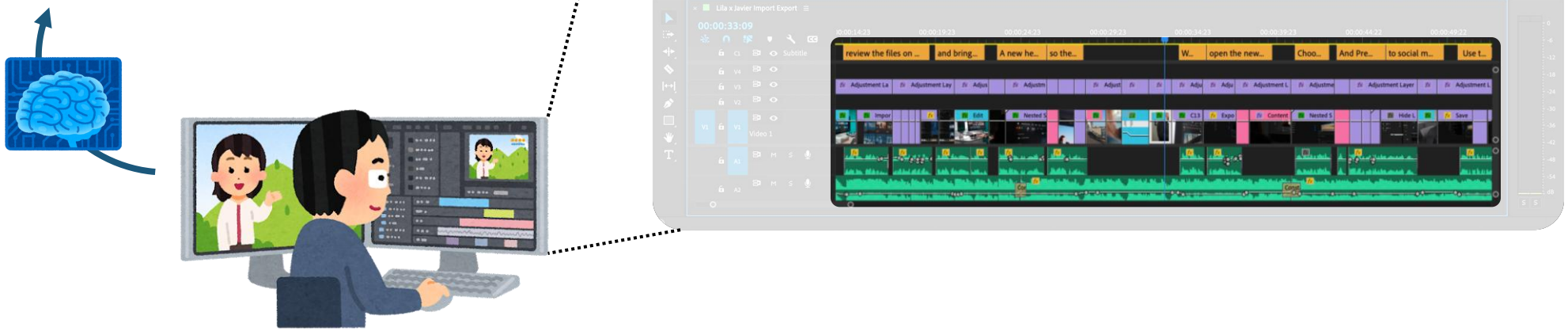
**User prompt**

Create a short video about the story of Saba Hamed in the context of refugees trying to enter EU

**Multimodal LLM**

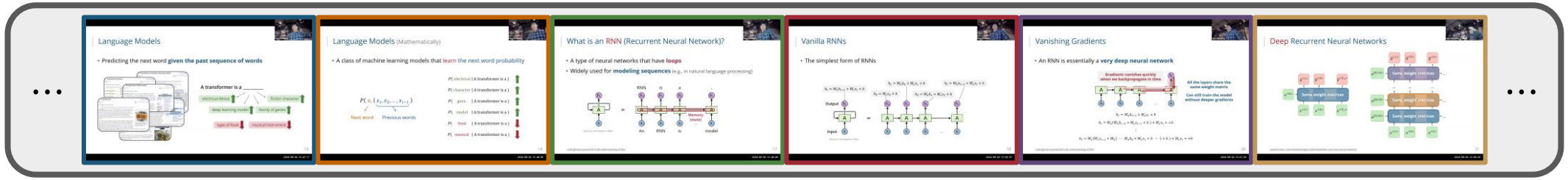
# Future Work: Integration into Video Editing Software

| | | |
|---|---|---|
| 00:03 – 00:17 | Narration | Saba Hamed's house has become a gathering place, because she's taken it upon herself to help refugees. Saba is Spanish, but has Moroccan roots and speaks Arabic. Her door is always open to everyone. |
| 00:20 – 00:28 | Interview | *"These folks wander aimlessly through the city, sleep outdoors, on the beach, in huts. It's bad."* |
| 00:30 – 00:39 | Narration | At her home, there's a room full of clothing that refugees are welcome to take and use. |
| 00:42 – 00:52 | Interview | *"All these clothes here were delivered the day before yesterday. All of these shirts, pants, underwear, socks, shoes, everything."* |
| 00:56 – 00:60 | Narration | Bilal Hanouti comes here every day and is thankful for the offer. |



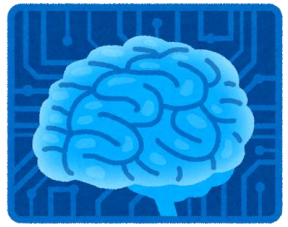
# Future Work: LectureRecap

**Lecture recording**

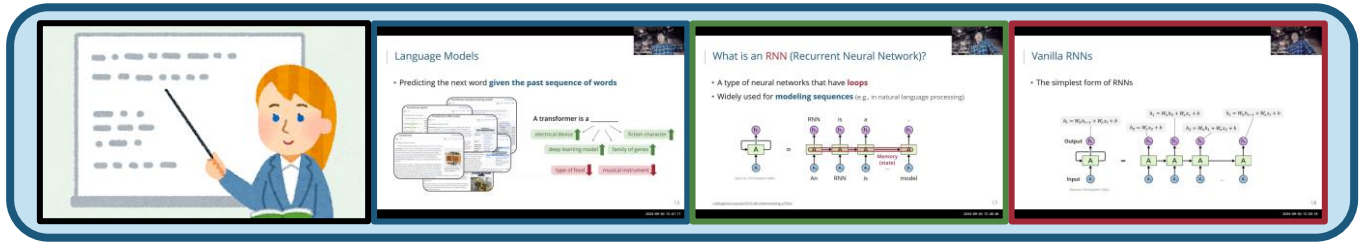



I would like to **review** the concept of **recurrent neural networks**. How does an RNN work?

Can you explain the **math** behind it?



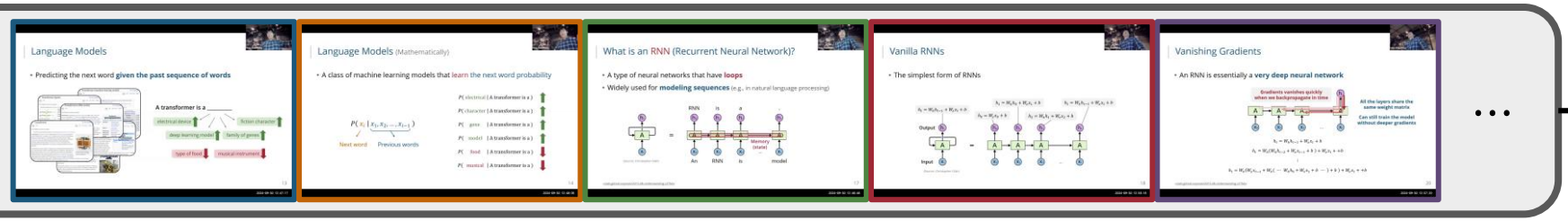
**LectureRecap**




**Lecture recap**

# Future Work: LectureRecap

**Lecture recording**




**User query**

I would like to **review** the concept of **recurrent neural networks**.

**Speech recognition**

**Script generation**

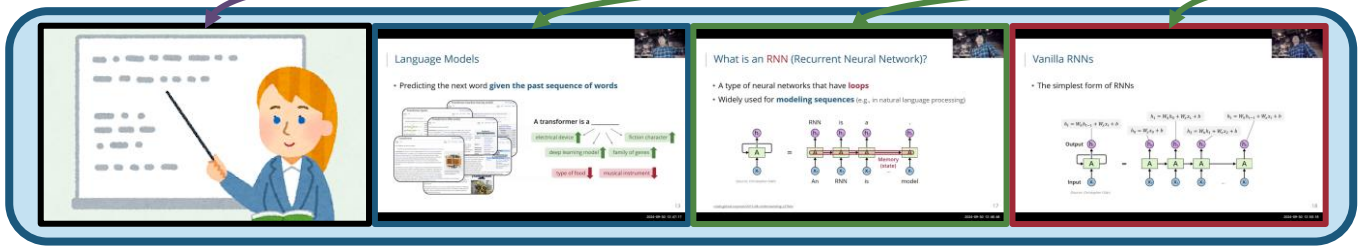
**Video script**

**[Narration]** Recurrent neural networks are a class of deep neural networks that …
**[Video clip insertion (10:24–12:48)]** Now let's first look at language models …
**[Video clip insertion (15:10–16:30)]** So what is a recurrent neural network? Intuitively, …
**[Video clip insertion (20:48–23:45)]** Mathematically, we can define an RNN as …

**Text-to-speech synthesis & talking head generation**

**Video clip extraction**

**Lecture recap**



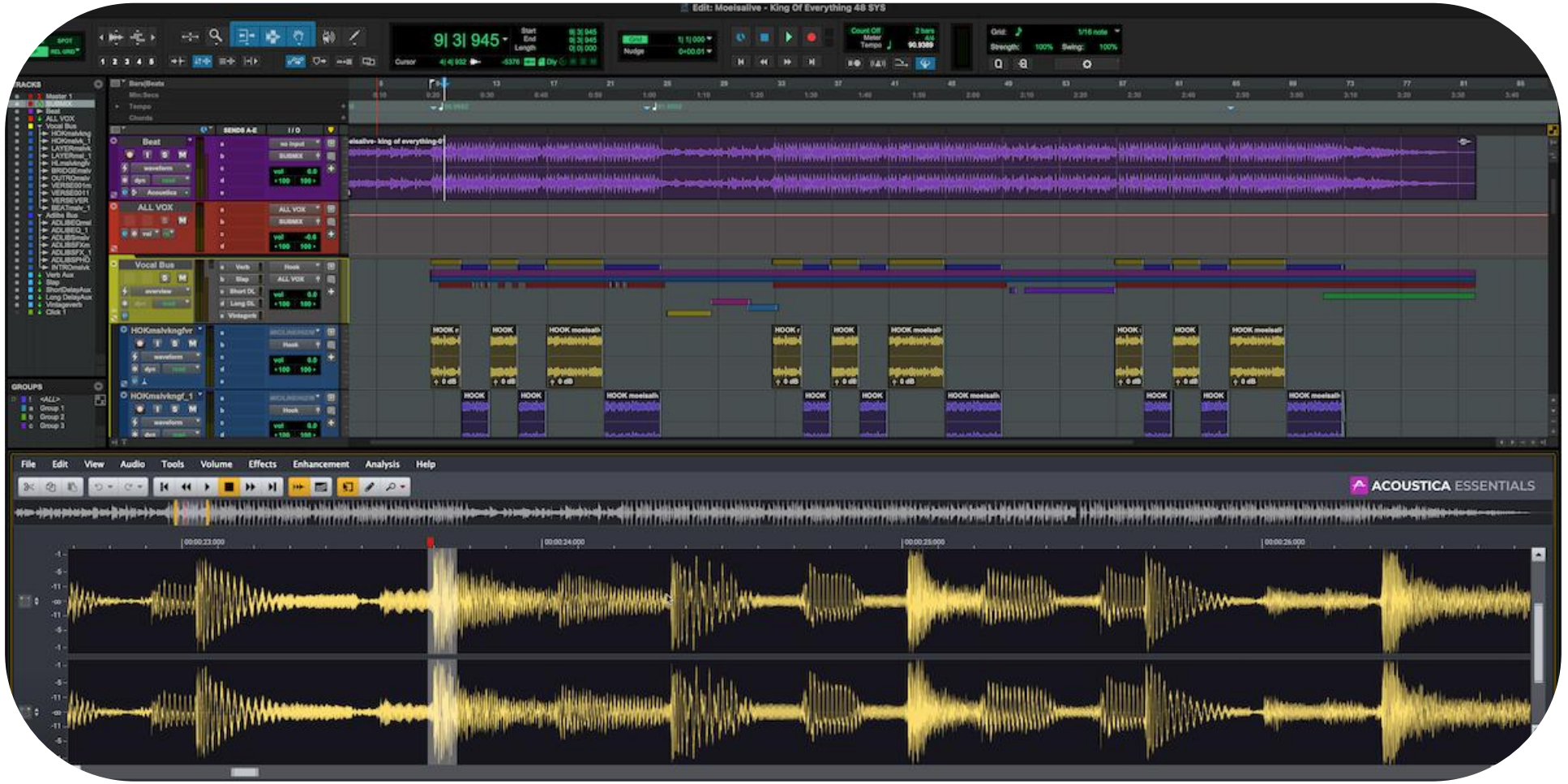
# Retrieval-Augmented → Retrieval-Embedded Generation

- Can an LLM **learn to quote** and **embed the quote properly**?

- How to **quote materials in other modalities**?
  - Audio, image, videos, sensor data, etc.

- What do we need?
  - A **retriever that can identify candidate quotable materials**
  - A **multimodal LLM that can understand multimodal data**

# Future Work: Integrating GenAI into Music Production




(Source: Avid)

avid.com/pro-tools/whats-new

# Future Work: Integrating GenAI into Music Production


(Source: Avid)

avid.com/pro-tools

Art challenges Technology



Creativity

Augmenting Human Creativity with AI

AI



Technology inspires the Art

# Augmenting Human Creativity with AI

- **Generative Models for Music Creation**
  - **Multitrack music generation** (AAAI 2018, ISMIR 2018, ISMIR 2020, ICASSP 2023, ISMIR 2024), **text-to-music generation** (ISMIR 2025), **video-to-music generation** (ISMIR 2025), **symbolic music processing tools** (ISMIR LBD 2019, ISMIR 2020)
- **AI-assisted Music Creation Tools**
  - **Expressive violin performance synthesis** (ICASSP 2022, ICASSP 2025), **music instrumentation** (ISMIR 2021), **music arrangement** (AAAI 2018), **music harmonization** (JNMR 2020), **a cappella source separation** (ISMIR LBD 2025)
- **Multimodal Generative Models for Content Creation**
  - **Long-to-short video editing** (ICLR 2025, NeurIPS 2025), **text-queried sound separation** (ICLR 2023), **text-to-audio synthesis** (WASPAA 2023)

# Generative AI for Music, Audio & Video Creation

(Source: The Denver Post)


(Source: UploadVR)


(Source: Descript)




(Source: Daily Bruin)

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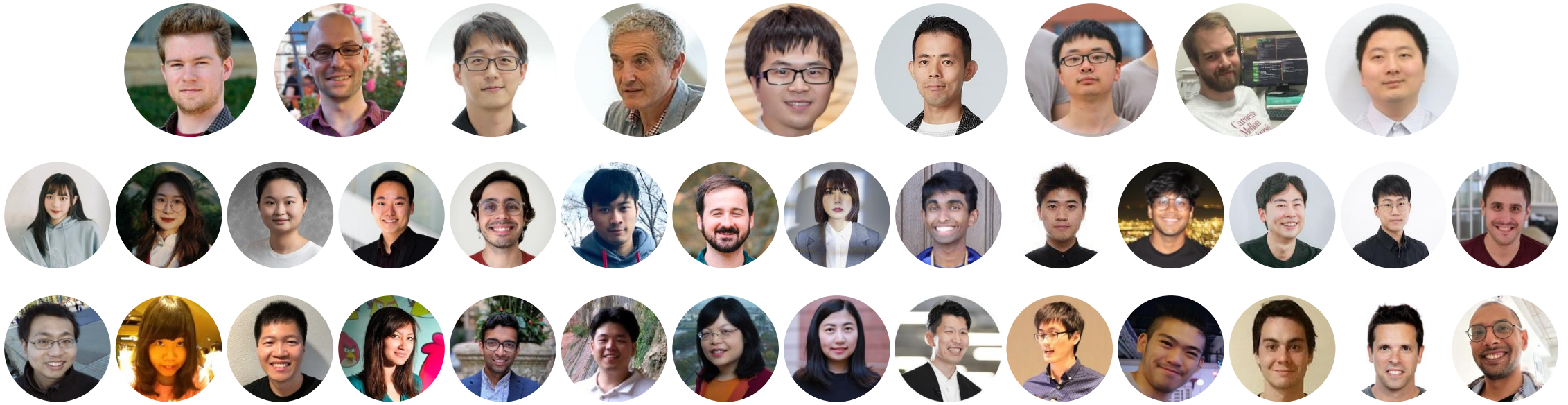
descript.com/blog/article/what-is-the-best-audio-interface-for-recording-a-podcast
denverpost.com/2019/08/02/colorado-symphony-movie-scores-harry-potter-star-wars/
dailybruin.com/2023/08/04/theater-review-the-musical-les-misrables-offers-stellar-displays-and-impassioned-vocals

# Augmenting Human Creativity with AI

- **Multimodal generative AI** for content creation
- **Human-AI co-creative tools** for music, audio and video creation
- **Human-like machine leaning algorithms** for music, movies and arts

# Augmenting Human Creativity with AI

**Nothing would have been possible without all my fantastic collaborators!**



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hermandong.com / hwdong@umich.edu

UNIVERSITY OF MICHIGAN