

CAN MUSIC MIXING BE SIMPLIFIED?

DMRN-16, 2021

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steinberg

Overview

1. Music Mixing
2. Difficulties with mixing
3. How can AI be used?
4. Background and Challenges
5. My PhD project
6. Challenges with the project



Music Mixing?

- Process of blending the recorded tracks together
- Creating a cohesive and well-balanced mixture
- Tracks are blended using DSP tools, also known as audio effects
- Audio effects include EQ, Compressor, Gain, Pan, Reverb, etc



Difficulties with Mixing

- Technical task
- Time Consuming
- Requires skills developed over years
- Lot of repetitive tasks
- Requires understanding of sound, music, and audio.



Why are we talking about simplifying mixing?

- Social media: made it easy to share content and art
- A lot of content being created per day
- Good mix improves the quality of content
- Amateurs should be able to produce music easily
- A number of musicians don't have technical knowledge
- Studios and Engineers expensive to hire



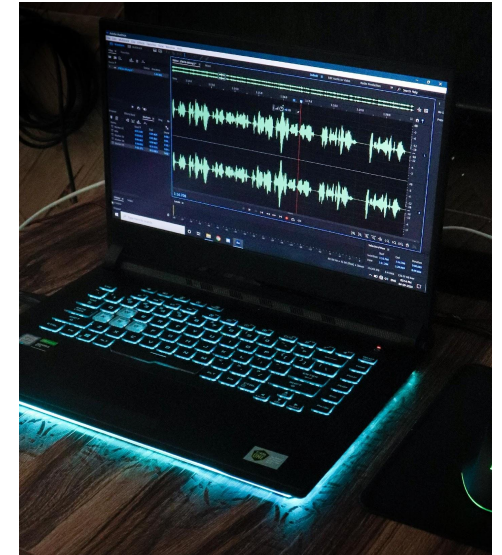
AI for Accessible Music Mixing: Mixing Simplified



Automate Audio effect Plugins



Suggestive tools: suggest next steps in the mixing process



End-to-end mixing: Input stems, output Mix

Automatic mixing research

Tracking academic work in the field of automatic multitrack audio mixing

Click the buttons below to filter the table of papers.

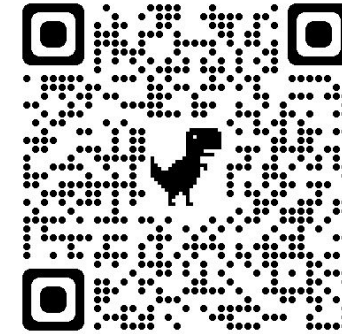
LEVEL EQUALIZATION COMPRESSION PANNING REVERB MULTIPLE MACHINE LEARNING KNOWLEDGE-BASED OVERVIEW CLEAR

Show 10 entries

Search: Multiple

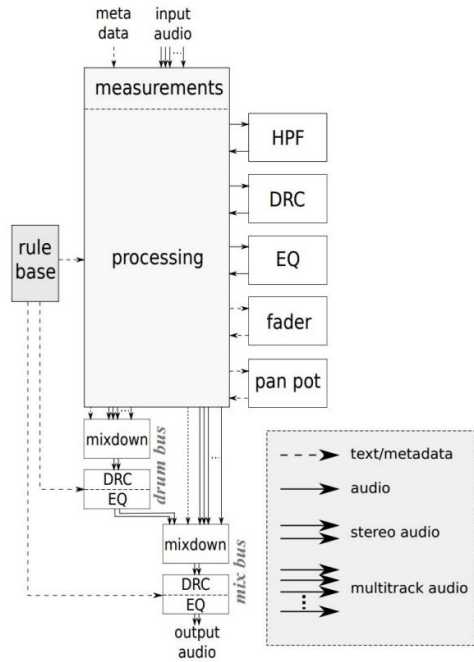
Year	Title	Author(s)	Category	Approach	Code
2021	A Deep Learning Approach to Intelligent Drum Mixing with the Wave-U-Net	M. Martinez Ramirez, D. Stoller and D. Moffat,	Multiple	ML	<code>CODE</code>
2021	Context Aware Intelligent Mixing Systems	M. N. Lefford, G. Bromham, G. Fazekas, and D. Moffat	Review	Multiple	
2020	Mixing with intelligent mixing systems: evolving practices and lessons from computer assisted design	M. N. Lefford, G. Bromham, and D. Moffat	Review	Multiple	
2020	Automatic multitrack mixing with a differentiable mixing console of neural audio effects	C. J. Steinmetz, J. Pons, S. Pascual, and J. Serrà	Multiple	ML	<code>CODE</code>
2019	Approaches in Intelligent Music Production	D. Moffat and M. B. Sandler	Multiple	Overview	
2019	Intelligent Music Production	B. De Man and J.D. Reiss and R. Stables	Multiple	Overview	

Thanks to Christian Steinmetz for maintaining the repo



A repository with all the related work done in this field:

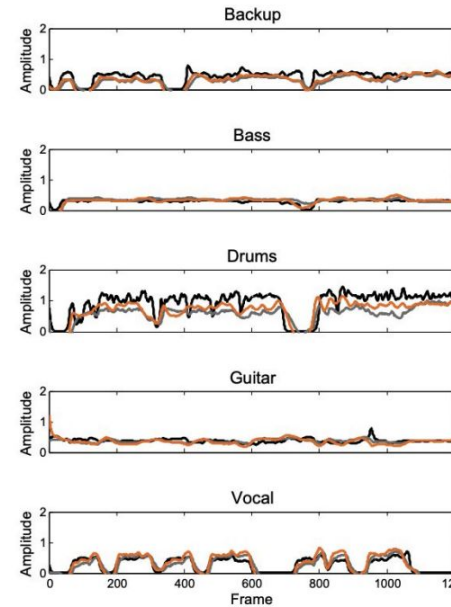
- Knowledge-based approaches
- Heuristic Approaches
- ML-based approaches
- Deep Learning-based approaches.



Knowledge-based systems

- Designed based on a set of rules from domain knowledge
- Lacks complexity and adaptability

A knowledge-engineered autonomous mixing system
Brecht De Man, Joshua D. Reiss AES 2013

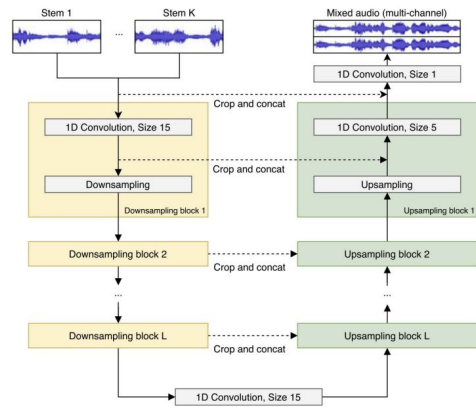


ML-based systems

- Leverages parametric data collected from pros
- Requires a lot of data

Analysis of acoustic features for automated multitrack mixing
Jeffrey J. Scott, Youngmoo E. Kim ISMIR 2011

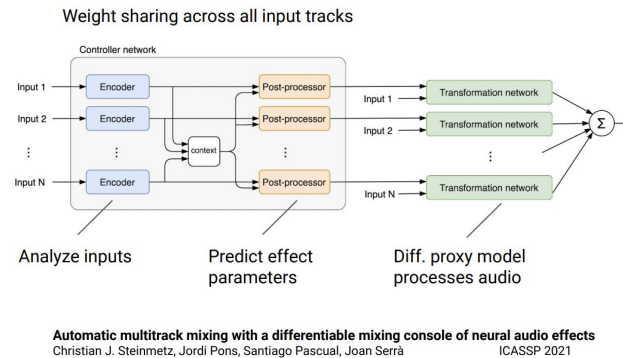
Deep Learning-based systems



A deep learning approach to intelligent drum mixing with the Wave-U-Net
 Marco A Martínez Ramírez, Daniel Stoller, David Moffat JAES 2021

Fully end-to-end systems

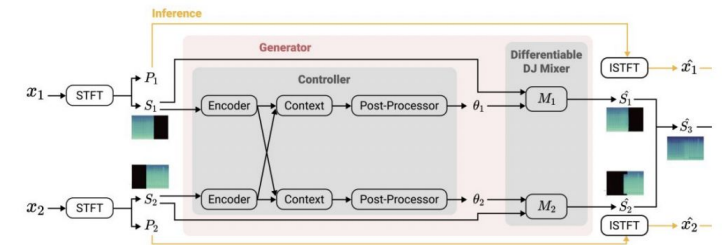
- Less interpretability
- Cannot adapt to high number of inputs
- User cannot adjust the final result



Automatic multitrack mixing with a differentiable mixing console of neural audio effects
 Christian J. Steinmetz, Jordi Pons, Santiago Pascual, Joan Serra ICASSP 2021

Neural Audio Effects

- Model Audio effects using Neural Networks
- Requires pre-training of effect networks which requires a lot of computing power



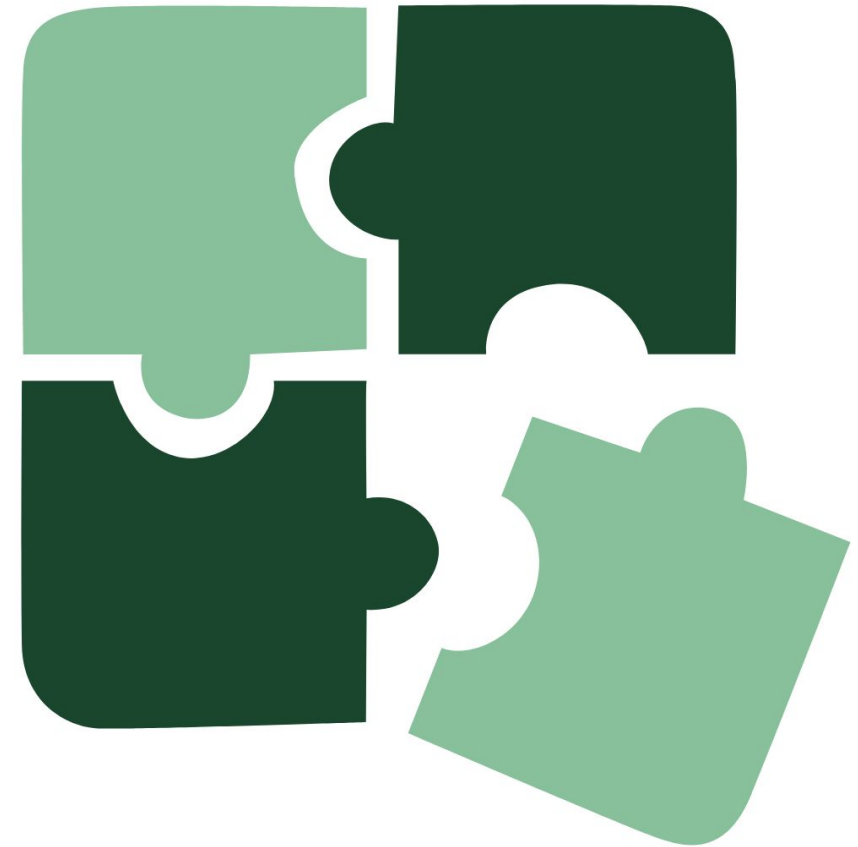
Automatic DJ Transitions with Differentiable Audio Effects and Generative Adversarial Networks
 Chen et al. arXiv 2021

DDSP systems

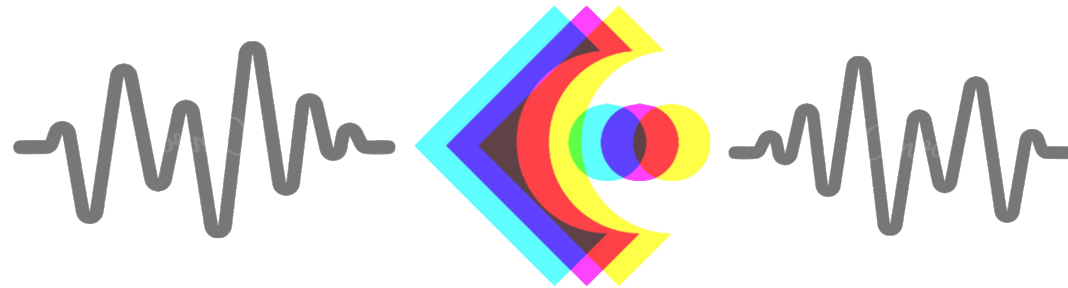
- Tries to use the domain DSP knowledge
- Uses NN to convert user's input into complex DSP controls

Challenges with AI-Assisted Music Mixing

- Limited number of Multi-track datasets
- Mixing is context dependent
- Number of inputs is variable
- Evaluation of a mix: What is a good mix?
- High quality audio outputs required
- Balance of user interaction and automation
- Mix invariance for different permutations of inputs



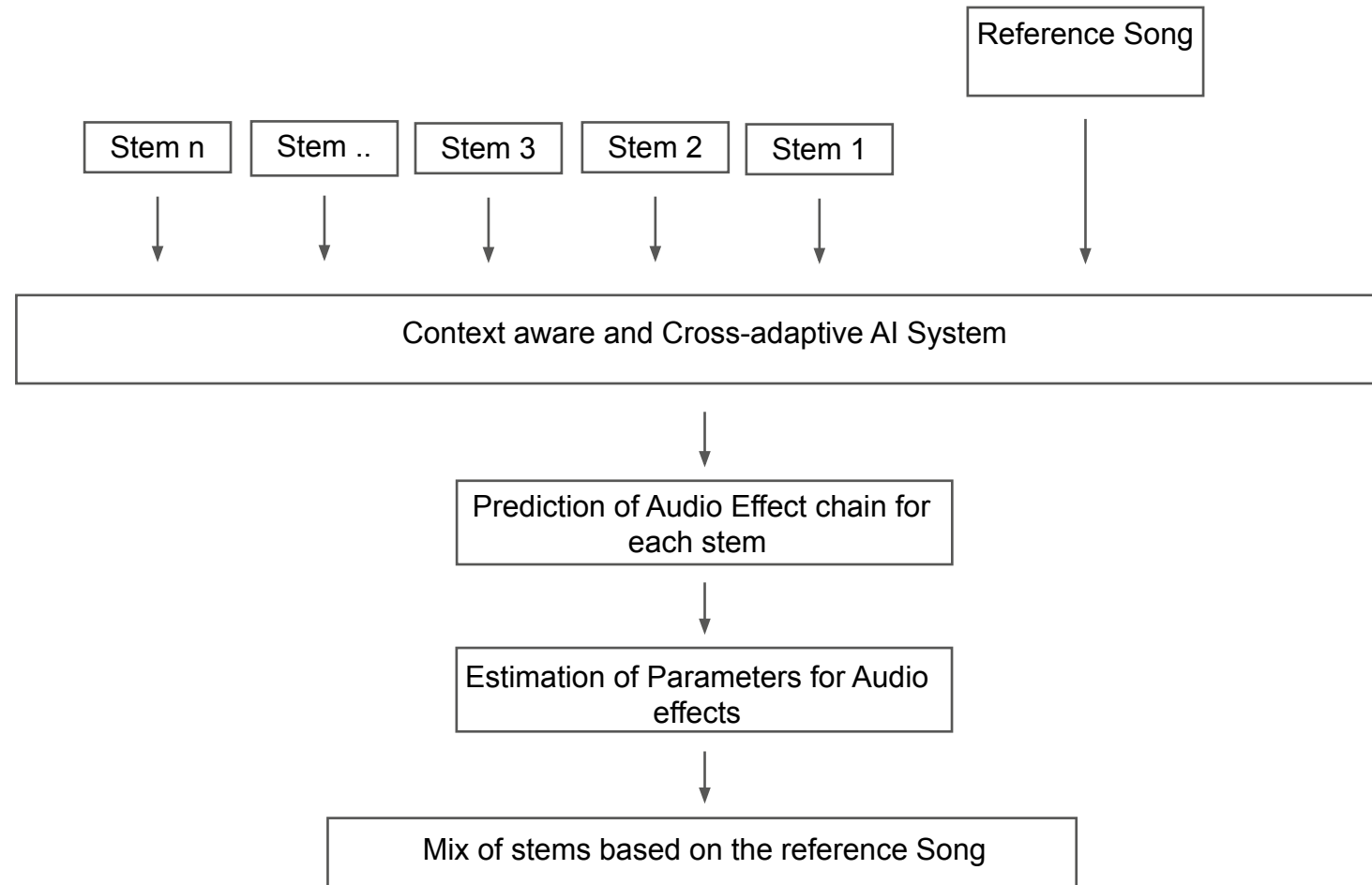
My PhD Project:



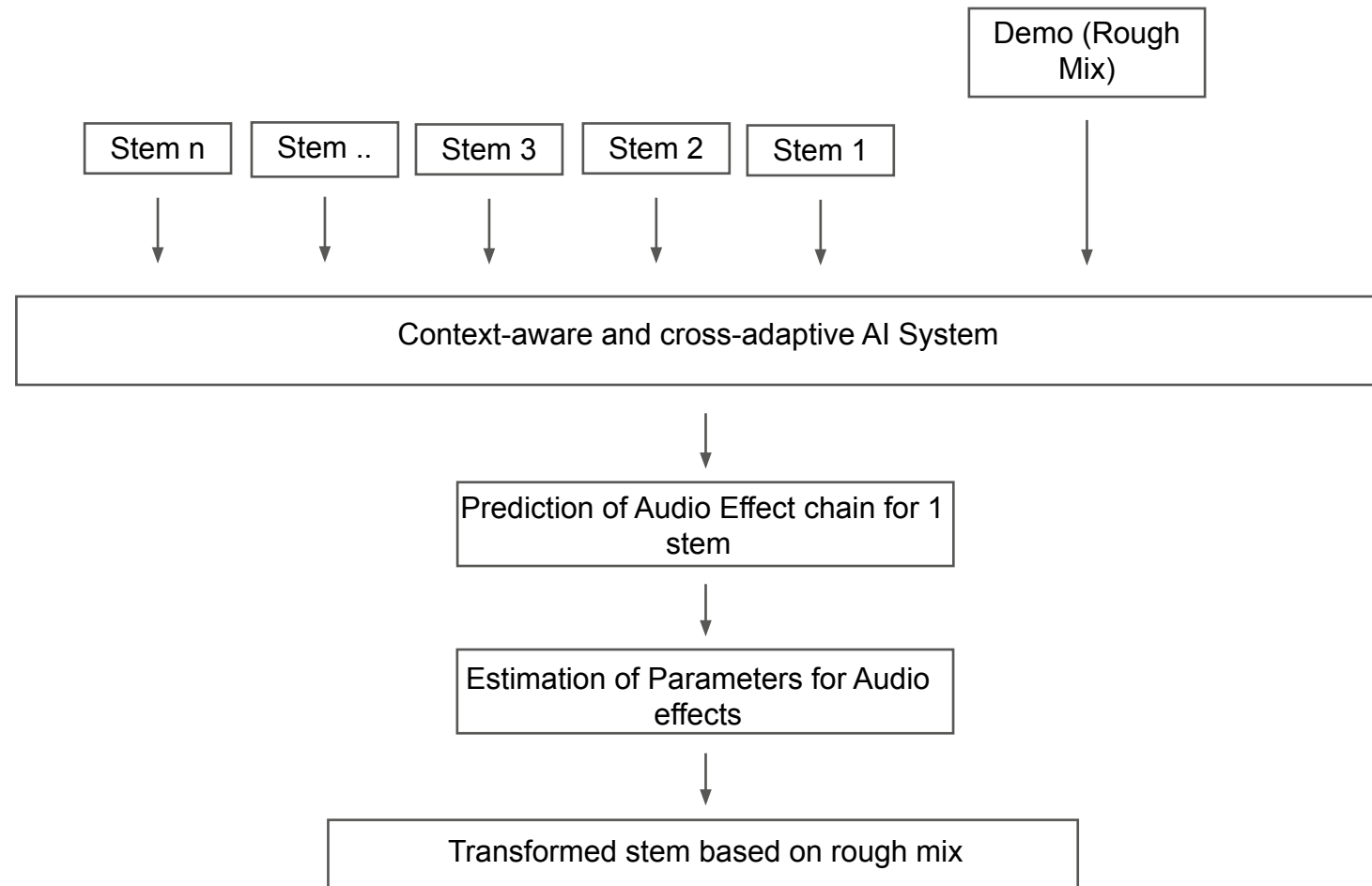
Hey AI, Can you mix my stems to produce a mix like “Fix You”?

- Can knowledge gained from experts be used to make process easier for amateurs?
- How can we transfer production-styles?
- How can we assess mix similarity?

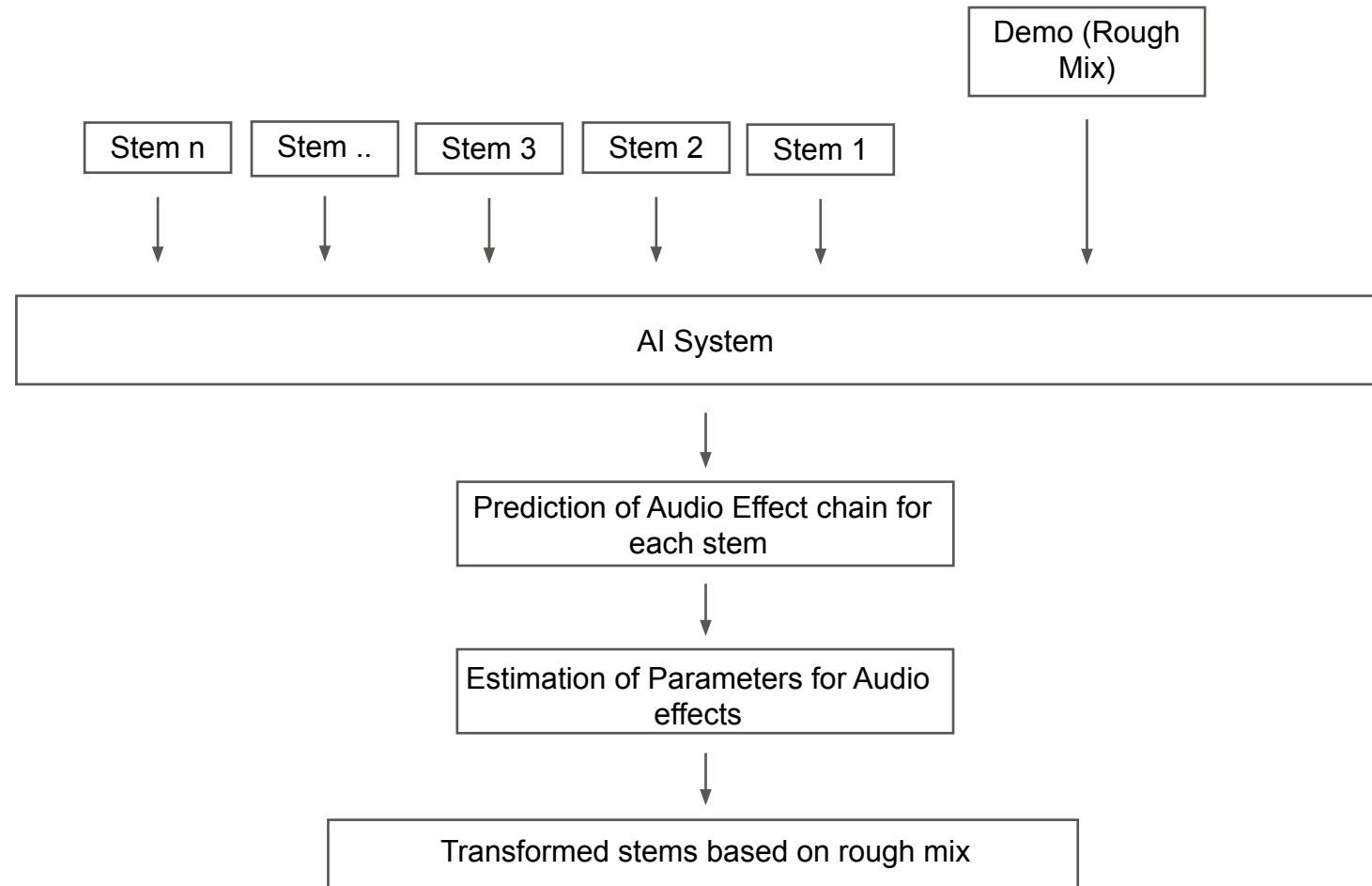
Mixing based on a reference song (Production Style Transfer)



Step 1: Stem Transformation based on a Demo (Rough Mix) (Production Style Transfer)



Step 2: Stems Transformation based on a Demo (Rough Mix) (Production Style Transfer)



Challenges?

- Creating multitrack dataset : Multitracks with Acceptable mixes and relevant reference tracks.
- Quantifying Mix Similarity: How to compare if the output mix is similar to the reference track?
- How can we transfer production styles : Inspiration from Tone transfer models?
- How to work with high-quality input audio and produce high-quality output audio?
- Figuring the perfect balance between automation and user-interaction



Why is this study important?(Outcomes/Applications)

- Easy-to-use mixing tools for amateurs
- Tools to automate repetitive tasks for professionals
- Live Music Mixing
- Music Restoration
- Educational Purposes
- Expand our understanding of mix and mix similarity



Bibliography

- Images: Google Images, Unsplash, Pixabay
- Icons: Canva



Any Questions, Comments, or Feedback?

Presentation citation

```
@inproceedings{key,  
author = "Vanka, Soumya; Fazekas, George; Rolland, Jean-Baptiste",  
title = "Intelligent Music Production: Music Production Style transfer and Analysis of Mix Similarity",  
publisher = "Poster presented at the 16th Digital Music Research Network(DMRN) Workshop",  
year = 2021}
```