ARTIFACT

A LARGE-SCALE DATASET WITH ARTIFICIAL AND FACTUAL IMAGES FOR GENERALIZABLE AND ROBUST SYNTHETIC IMAGE DETECTION

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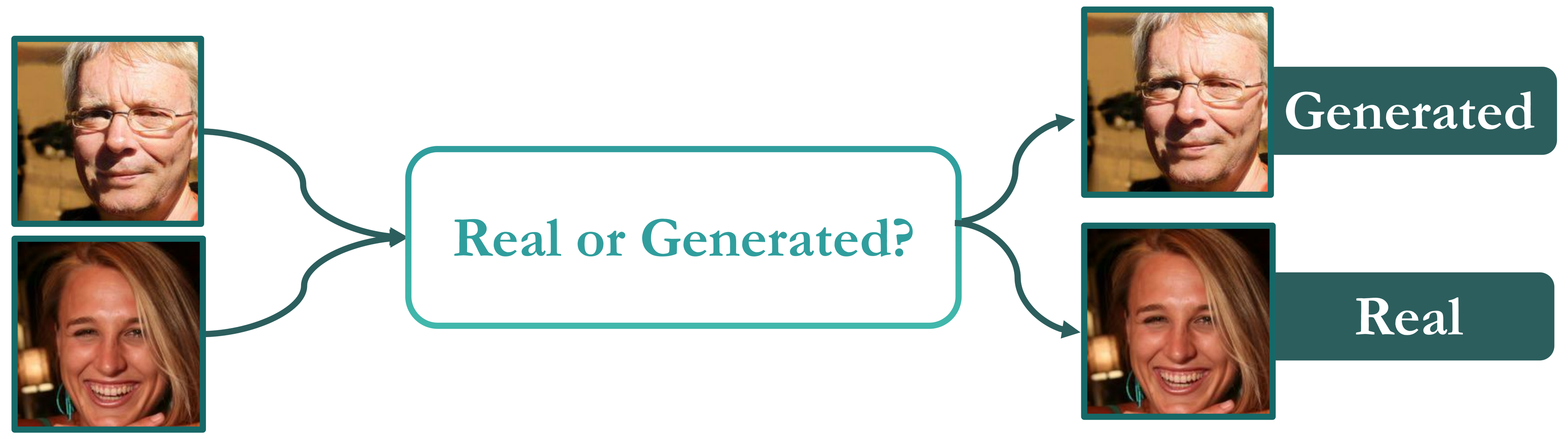
30th ICIP 2023 Kuala Lumpur

Introduction



- **Task**:

detecting synthetic images by identifying unique artifacts in generated/manipulated images

- **Differentiation**:

Real images lack this artifact, making detection possible

- **Applications:**
  - Fraud Prevention
  - Content Moderation
  - Art Forgery Detection
  - Media Integrity Verification

Challenges

Lack of a comprehensive dataset

- Diversity of Generators (GAN-Diffusion, Fully-Partially manipulating)
- Diversity of Object Categories (Humans, Animals, Vehicles, Places, etc.)
- Reflects Real-World Scenarios (Social Media: Compression, Downsampling)

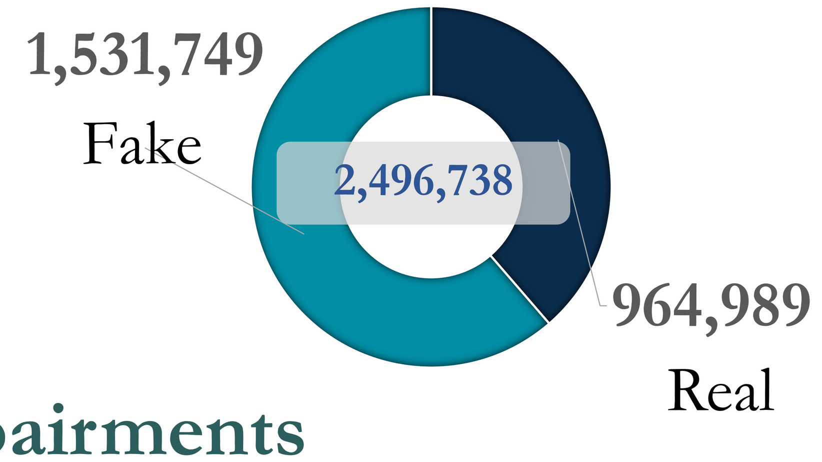
Lack of Generalizable & Robust Solution

- Detect images from Unseen Generators (Generalization)
- Detect images in presence of Real-World Impairments (Robustness)

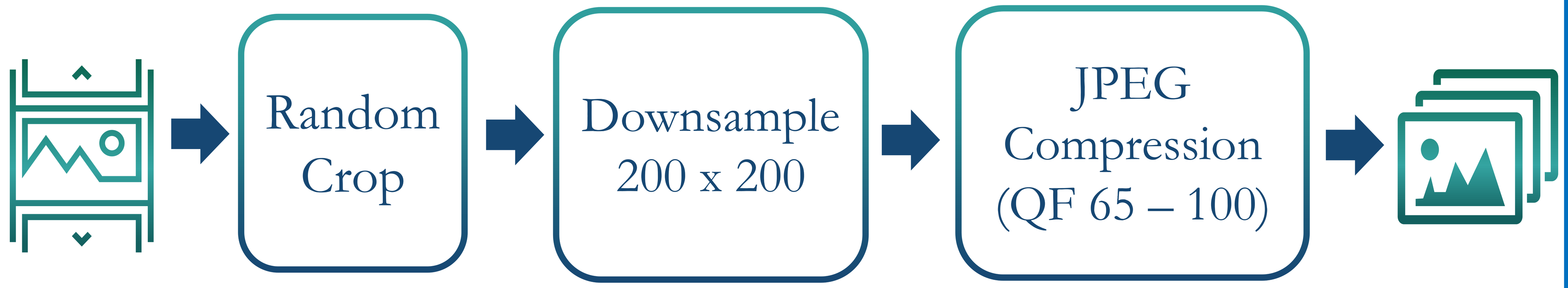
Contribution

1. Proposed ArtiFact dataset with ~2.5 Million images,
   a) Diverse Generators
   b) Diverse Object Categories
   c) Reflects Real-World Scenarios
2. Proposed Generalizable & Robust Solution,
   a) Multi-class scheme with an extra class to detect Unseen Generators
   b) Filter Stride Reduction (FSR) strategy to tackle Impairments

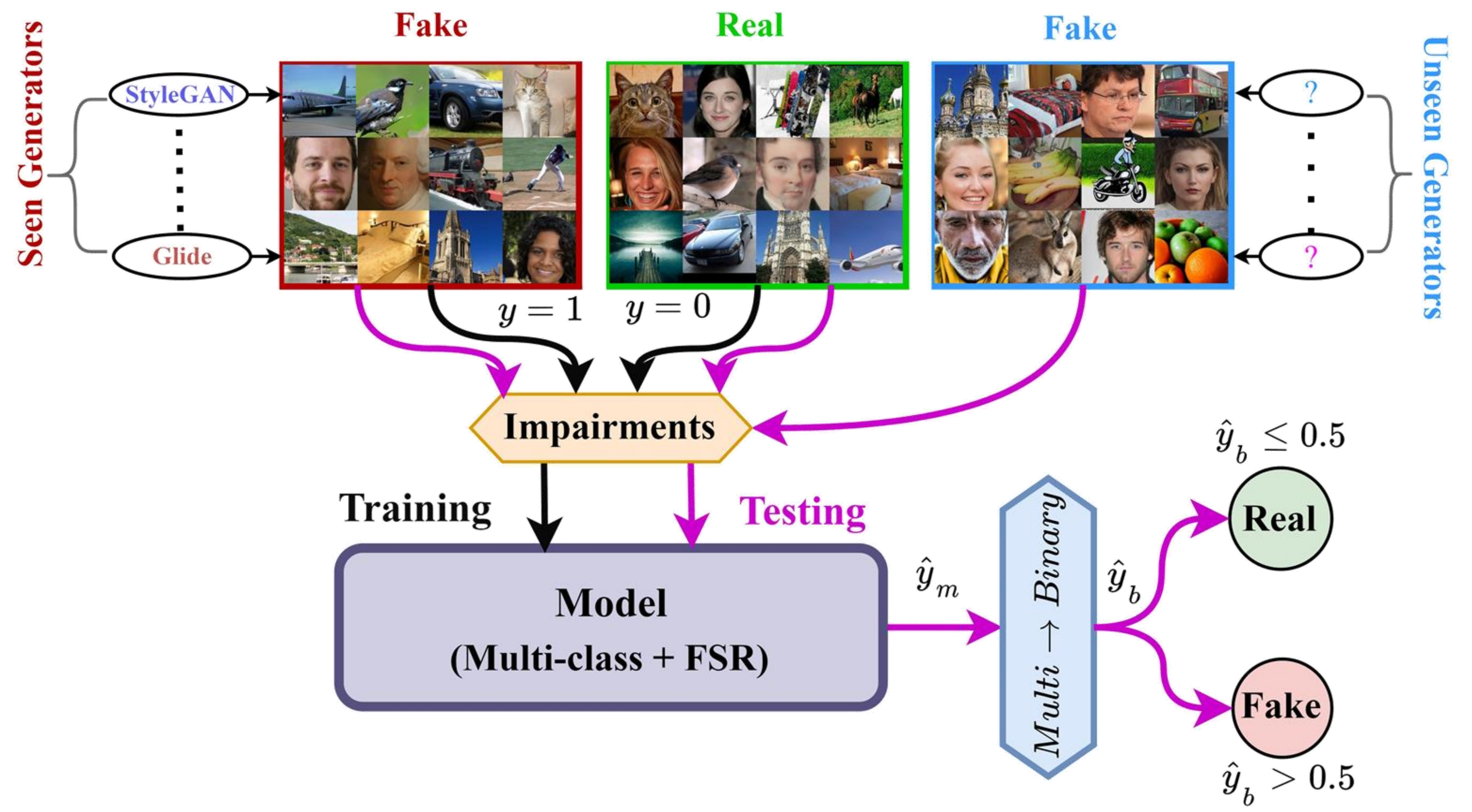
Diffusion: **7**	Partially Manipulating: **5**
GAN: **13**	Fully Manipulating: **20**
Others: **5**	



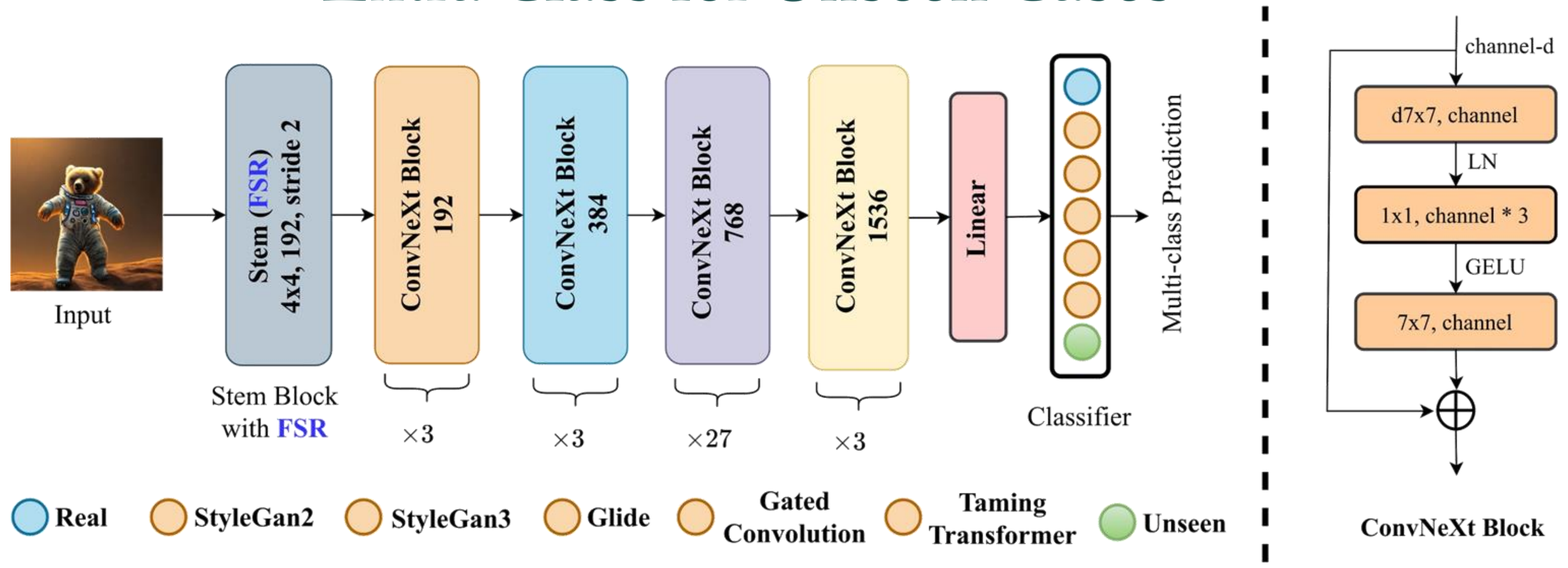
Real World Impairments



Solution Overview



Extra Class for Unseen Cases

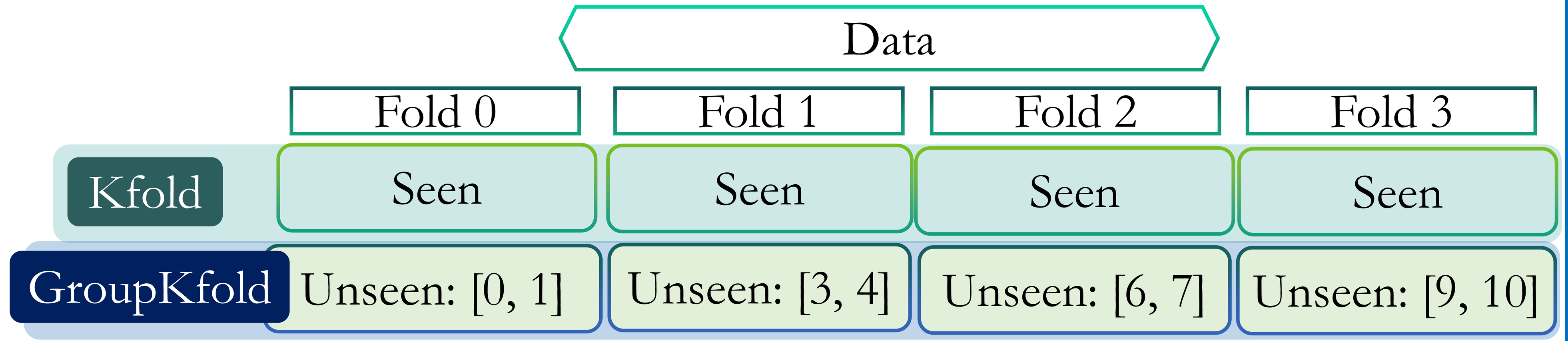


Multi-class to Binary Class

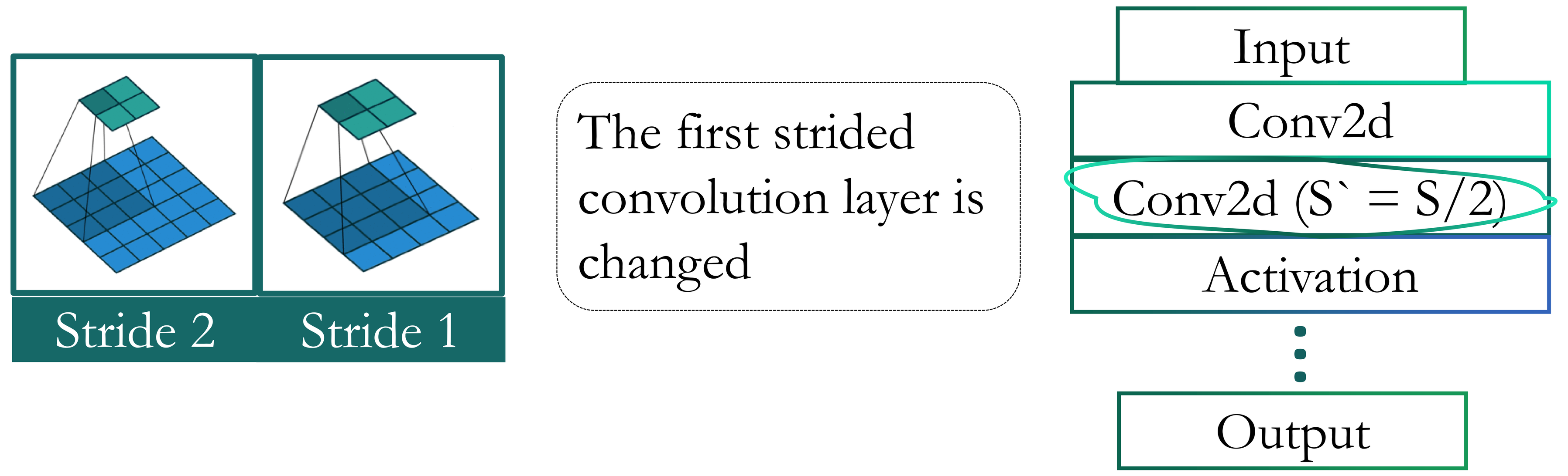
	Real	Seen Fake					Unseen Fake
Multi-class Pred =	0.04	0.00	0.02	0.01	0.03	0.0	0.90

Binary-class Pred = 1 - 0.04 = 0.96

CV Split



Filter Stride Reduction (FSR)



Results

Ablation Studies

Method	Accuracy
Binary-class	78.21
Binary-class + FSR	81.30
Multi-class	83.12
Multi-class + UF class	84.98
Multi-class + FSR	85.56
Multi-class + FSR + UF class	**87.62**

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Team Names	Test 1	Test 2	Test 3
Sherlock	87.70	77.52	73.45
FAU Erlangen-Nürnberg	87.14	81.74	75.52
Megatron (Ours)	**96.04**	**83.00**	**90.60**

Comparison

Method	Accuracy
Joel et al. [3]	63.19
Francesco et al. [6]	79.28
Wang et al. [11]	79.95
Gragnaniello et al. [12]	81.63
Multi-class + FSR + UF class (ours)	**87.62**

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