Freely Available Large-Scale Video Quality Assessment Database in Full-HD Resolution with H.264 Coding

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Presentation Outline

- What is the current problem?
- What is our solution?
- Where are we?
- What are the next steps?
- Do we need help?

What is the current problem?

- New objective, **No-Reference** (**NR**) video quality metrics require video databases with subjective ground-truth, for:
  - Evaluating their performance
  - Determining their effective application scope
- Current video databases, often focusing on particular use case (e.g.: only **Quantization Parameter**, **QP**), due to some problems:
  - **Encoding** - amount of engineering work with database creation
  - **Obtaining ground-truth** - unfeasible for large database

What is our solution? For encoding...

1. Selecting source videos (**Source Reference Circuits**, **SRC**)

2. Selecting exhaustive number of encoder settings (**Hypothetical Reference Circuits**, **HRC**)

3. Employing super-computer cluster to get encoded videos (**Processed Video Sequences**, **PVS**)

What is our solution? For obtaining ground-truth...

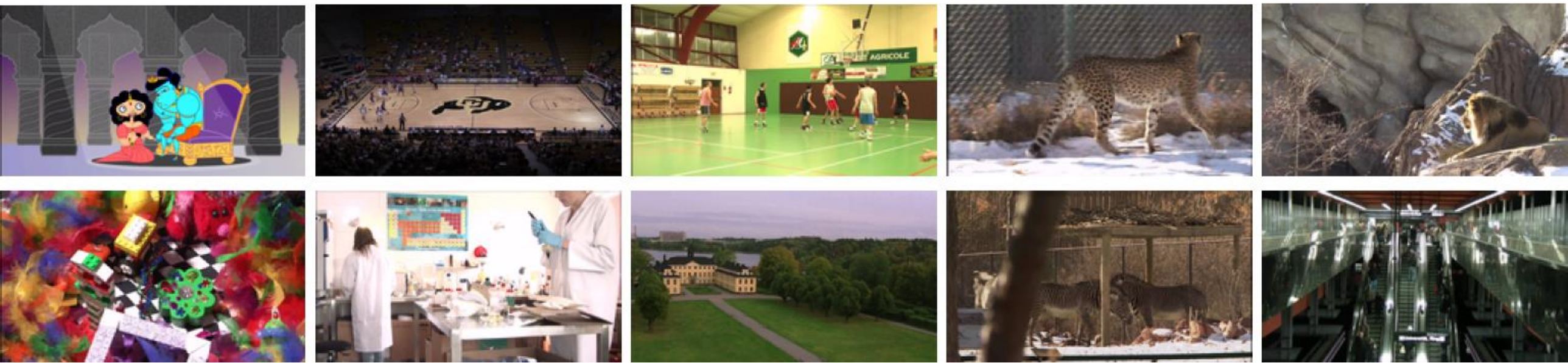
1. Using existing well-established objective **Full-Reference** (**FR**) metrics

2. Using subjective **crowdsourcing experiments** on constrained subset

3. Using subjective **in-lab experiments** on even more constrained subset

Where are we? Selecting SRC...

- **10x1080p@25 SRC** selected from **Video Quality Experts Group** (**VQEG**) resources, covering many different features:
  - Synthetic sequences
  - Professionally shot natural content sequences
  - User generated content sequences
- Video content - below:



Where are we? Selecting HRC...

	Basic compression	Temporal and spatial changes	Time prediction	I, P, B frame size factors
Bit-rate	1, 2, 4, 8, 16 Mbit/s			
QP	26, 32, 38, 46			
GOP length	8, 16, 32, 64	32, 64		
Number of B frames	0, 2, 3, 7	2		
B-pyramid	strict, none	none		
Frame rate	25	12, 8	25	
Resolution	1920x1080	960x540, 480x270	1920x1080	
Integer pixel motion estimation method	Default		dia, esa, umh	Default
Maximum motion vector search range	Default		4, 64	Default
Number of reference frames	Default		4, 16	Default
Number of slices per frame	1, 2			1
I to P frame ratio	Default			0.8, 1, 1.2, 1.4
P to B frame ratio	Default			0.5, 0.8, 1, 1.2, 1.4

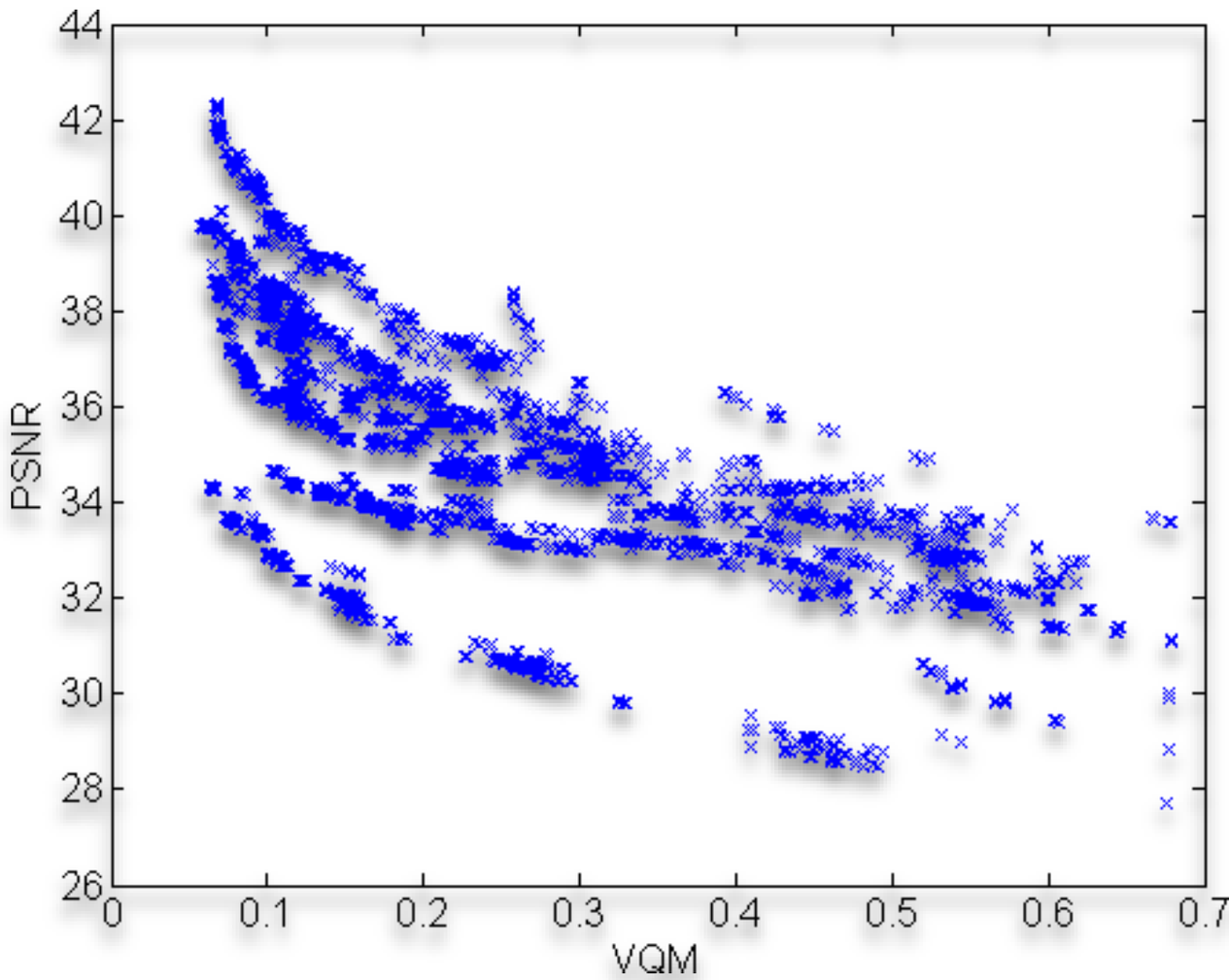
Approximately **1300** different encoder settings!

Where are we? Getting PVS...

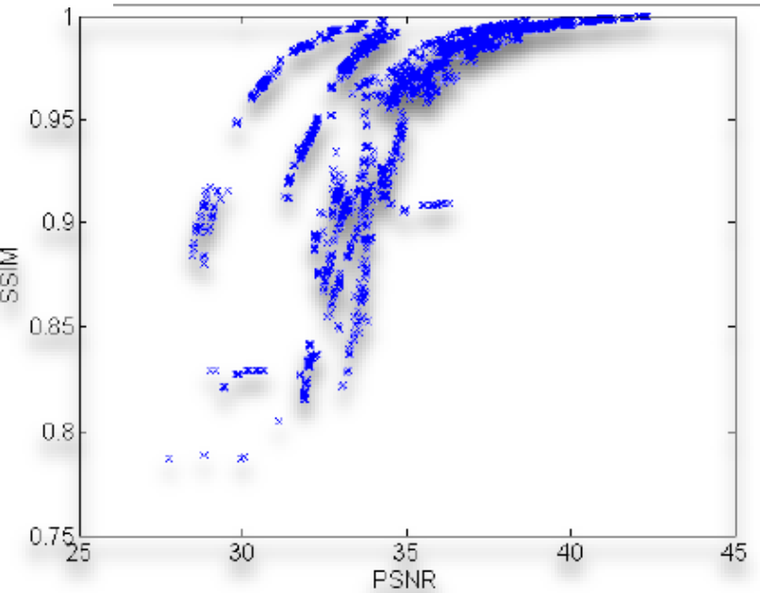
- Pre-processing:
  - Source **AVI** format using **YCbCr** space with **422** sampling
    - Sub-sampled with **Lanczos** to **420** sampling
- Two well-known encoders: **JM** and **x264**
- Post-processing: decompression, destination **AVI** format
- Approximately **13,000** different **PVS**!

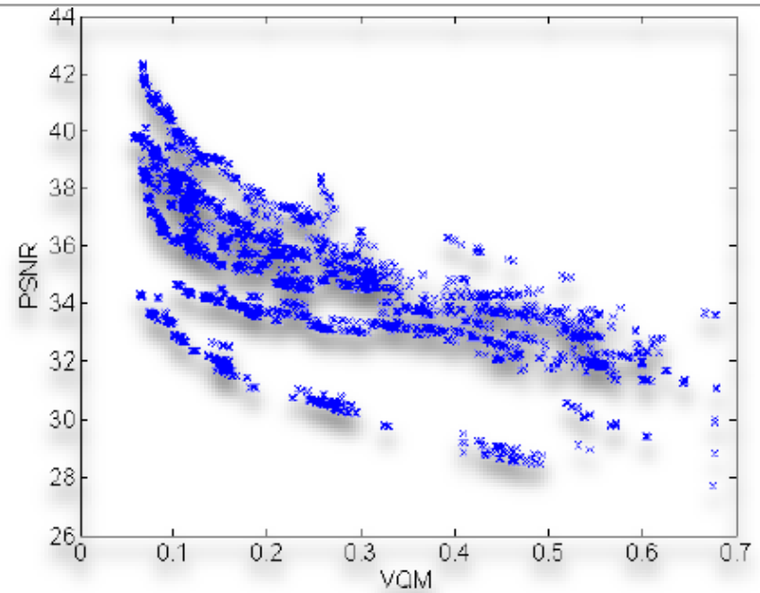
Where are we? Using FR...

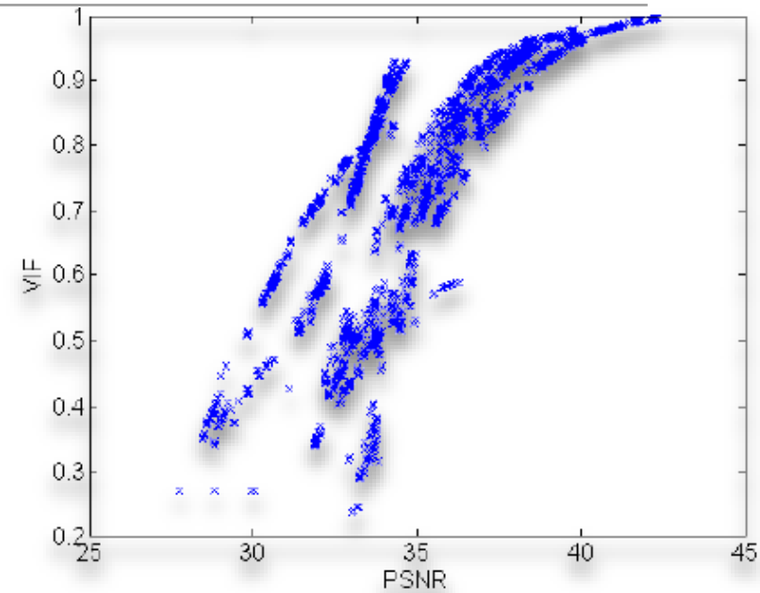
- Metrics used and inter-checked:
  - **Peak Signal-to-Noise Ratio** (**PSNR**)
  - **Structural Similarity Index** (**SSIM**)
  - **Video Quality Metric** (**VQM**)
  - **Visual Information Fidelity** (**VIF**)
- **"Bonus Track"** - some extra **NR** parameters and metrics provided:
  - **Spatial Activity** (**SA**)
  - **Temporal Activity** (**TA**)
  - **Blockiness**
  - **Blur**

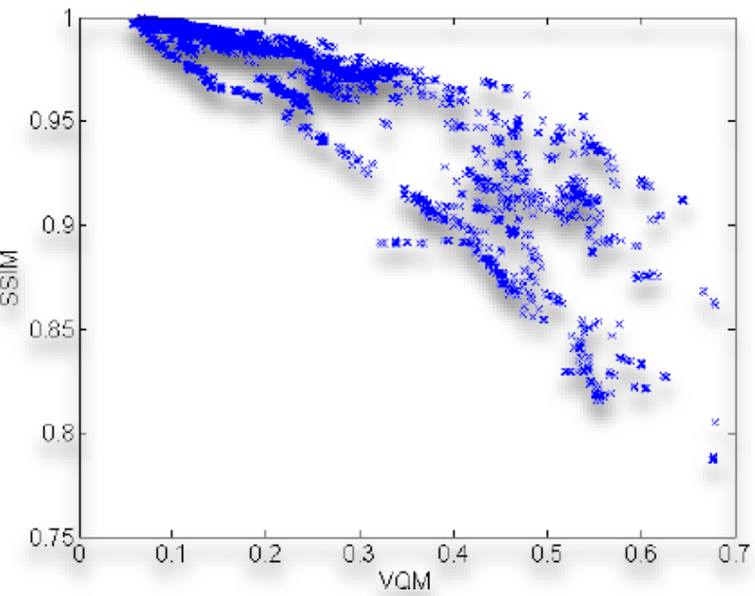


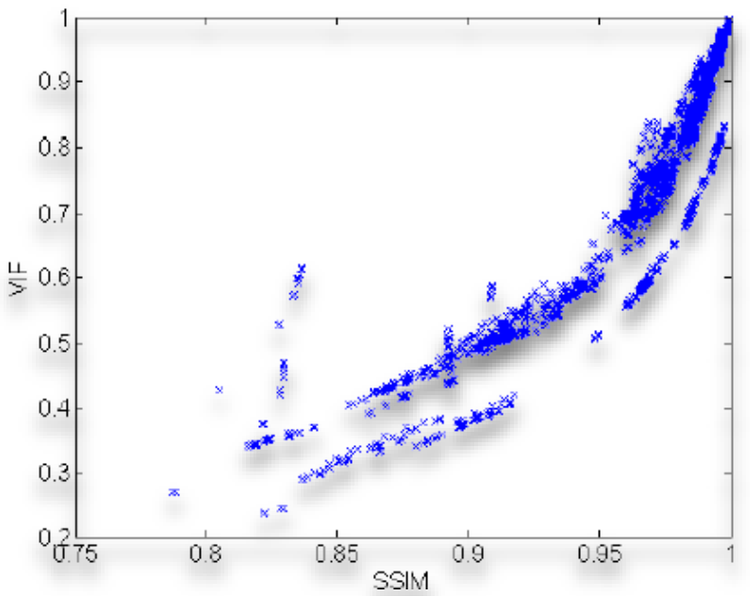
Where are we? Using FR...

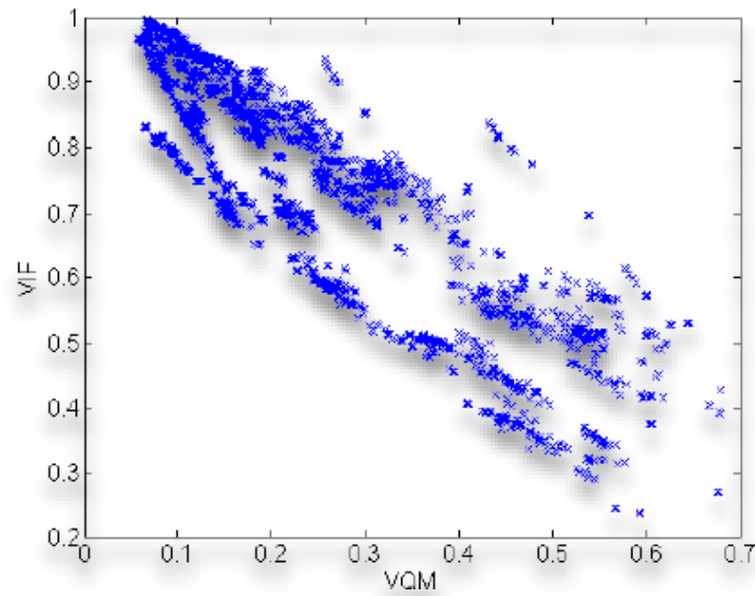






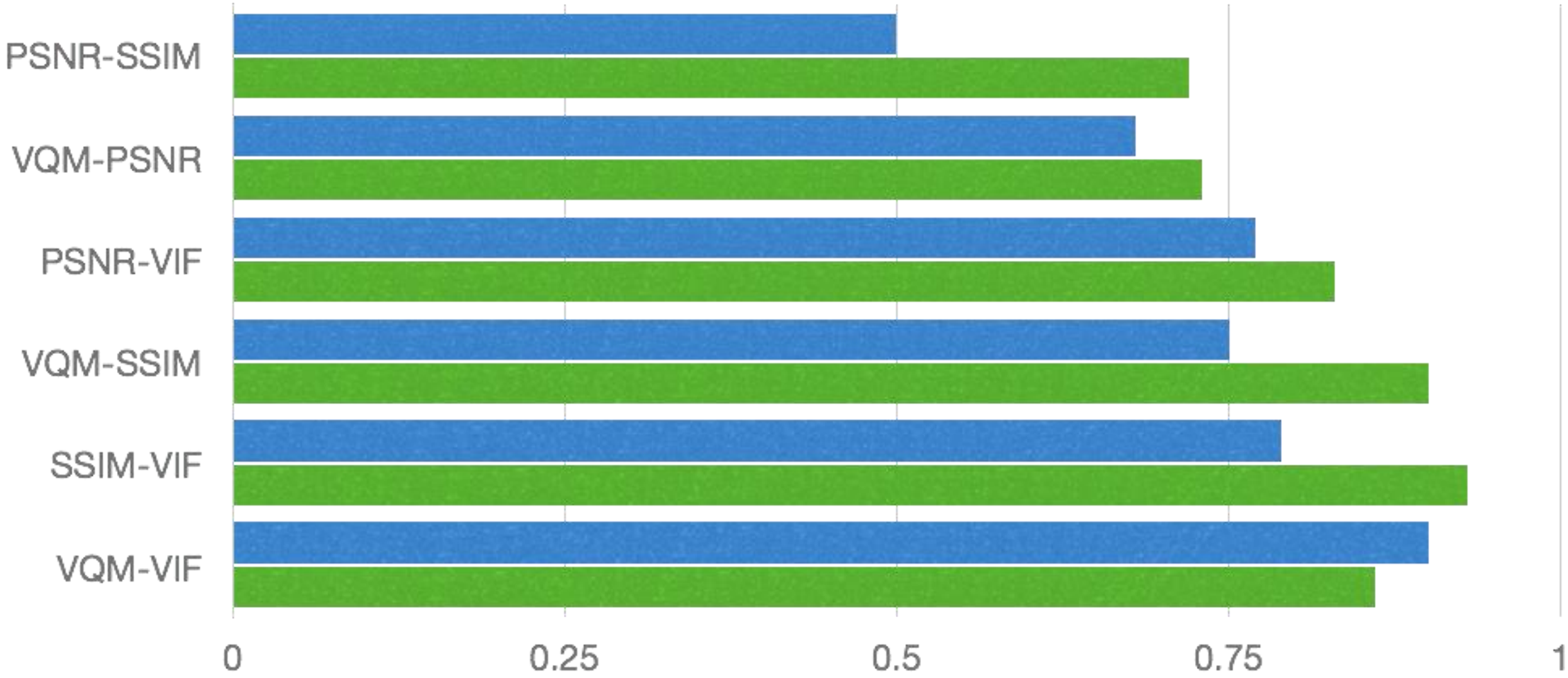






Where are we? Using FR...

Absolute correlation and distance of **FR** metrics:
PLCC - Blue, **SROCC - Green**



What are the next steps?

- Refining:
  - More **SRC** to encode
  - Making **PVS** creation system distributable so that people don't need to download sequences and can run on any source
  - More **FR** metrics
- Progressing:
  - **Crowdsourcing experiments**
  - **In-lab experiments**

Do we need help?

- **Yes!**
- Relation to **VQEG** and its **Joint Effort Group** (**JEG**)
- Please **join JEG**:
  - **http://www.its.bldrdoc.gov/vqeg/projects/jeg/jeg.aspx**
- Please **download database**:
  - **ftp://ftp.ivc.polytech.univ-nantes.fr/VQEG/JEG/HYBRID/database/**
  - Database using modular naming approach for file names
  - Resulting data freely available to research community

Thank You / Acknowledgments

- Research work supported in part by **Polish National Centre for Research and Development** (**NCRD**) under **Grant No. SP/I/1/77065/10** by **Strategic Scientific Research and Experimental Development Program**: **“Interdisciplinary System for Interactive Scientific and Scientific-Technical Information”**

- Research work supported in part by **PL-Grid Infrastructure**

- Research work has been supported in part by **AGH University of Science and Technology** under **Department of Telecommunications Statutory Work**