Introduction to Intel® Distribution of OpenVINO™ toolkit for Computer Vision Applications

100: Beginner-level
Lesson 03

Introduction to Intel® Distribution of **OpenVINO™** toolkit for Computer Vision Application

OpenVINO 100 – **Course agenda**

Lesson 1: Introduction, why do we need Artificial Intelligence (AI).

Lesson 2: What is Video, what is computer vision, how do we accelerate it on modern computers.

Lesson 3: How to accelerate Video processing

Lesson 4: How to accelerate Neural Network for vision applications

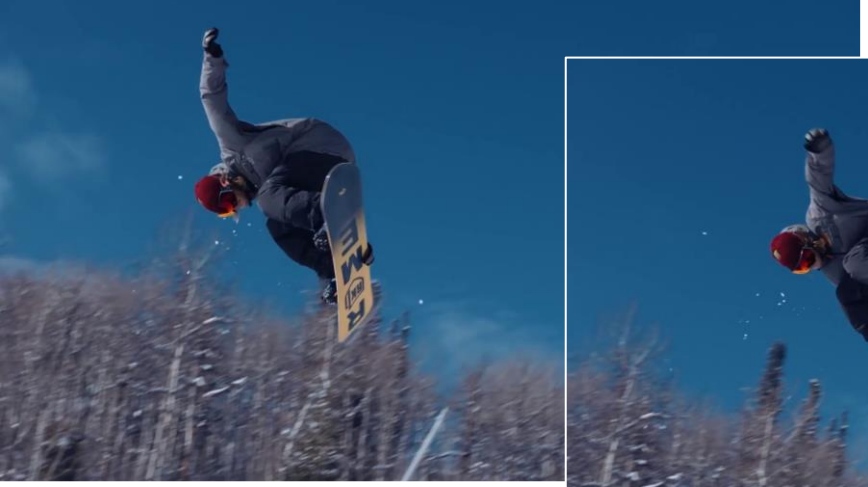
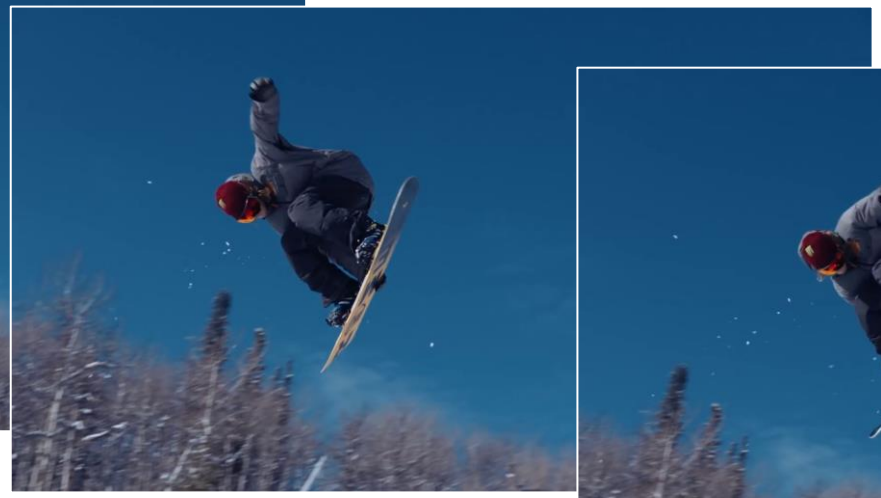
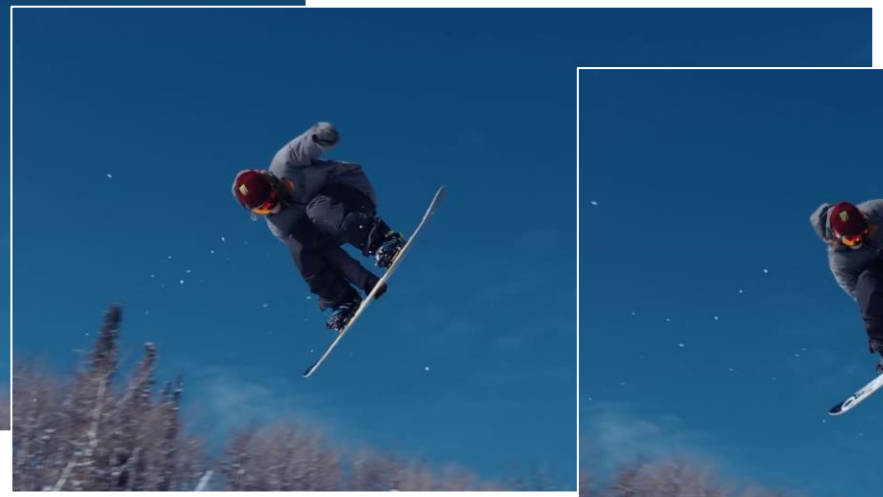
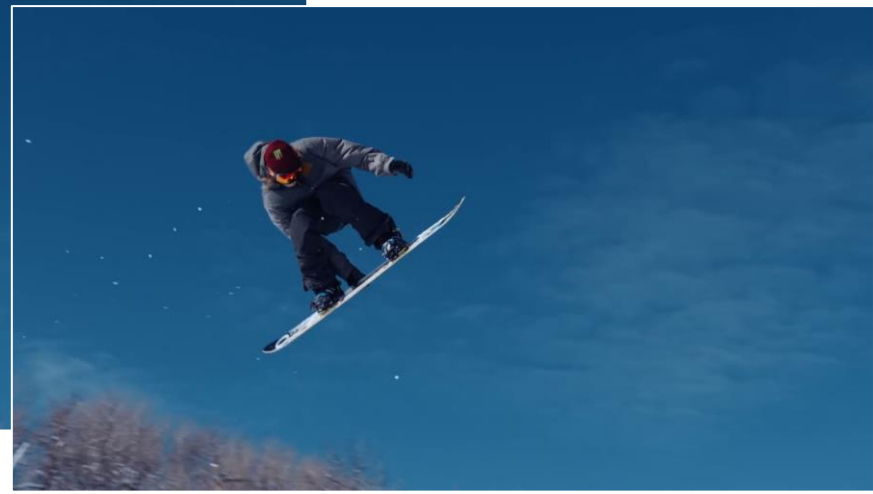
Lesson 5: Video Analytics pipeline

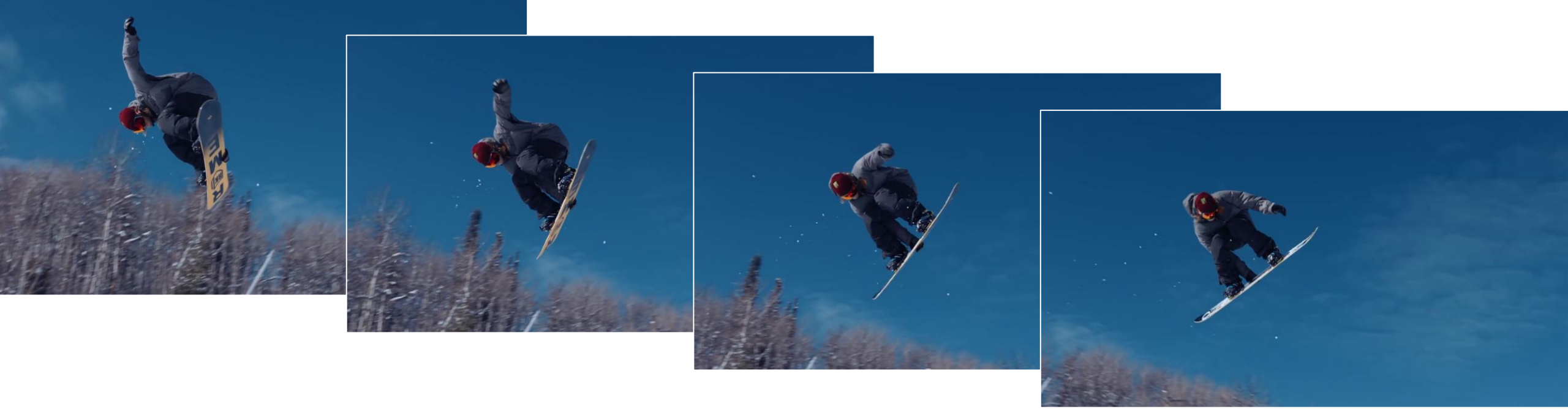
Lesson 6: Demos, OpenVINO at work

Lesson 7: The full flow, from Data to a product using Intel tools-Part 1.

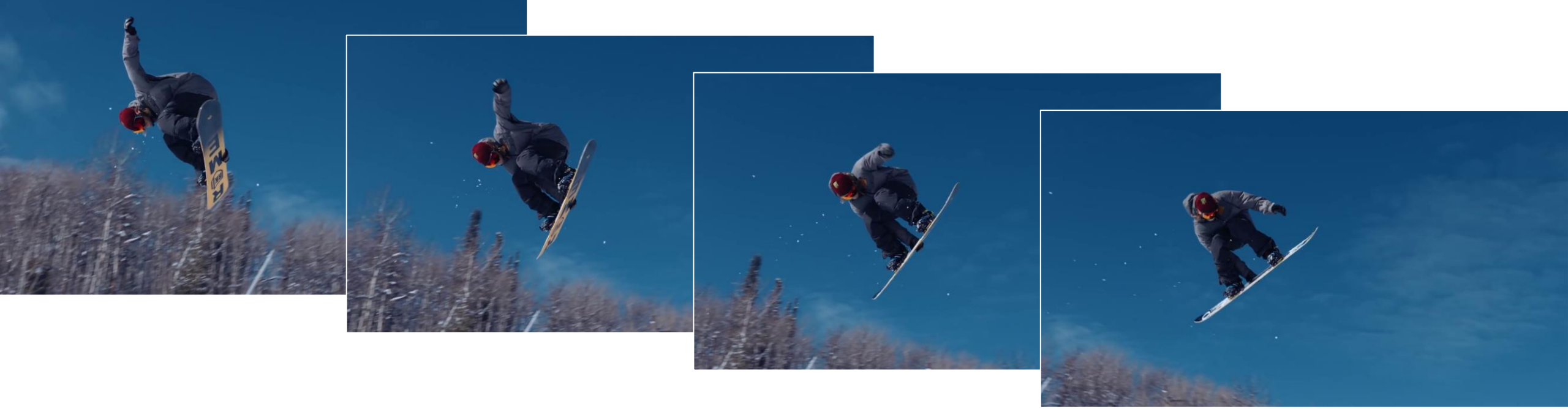
Lesson 8: The full flow, from Data to a product using Intel tools-Part 2.

Lesson 9: Summary, intro to next course (200)



– 1 Frame = 1920 x 1080 pixels



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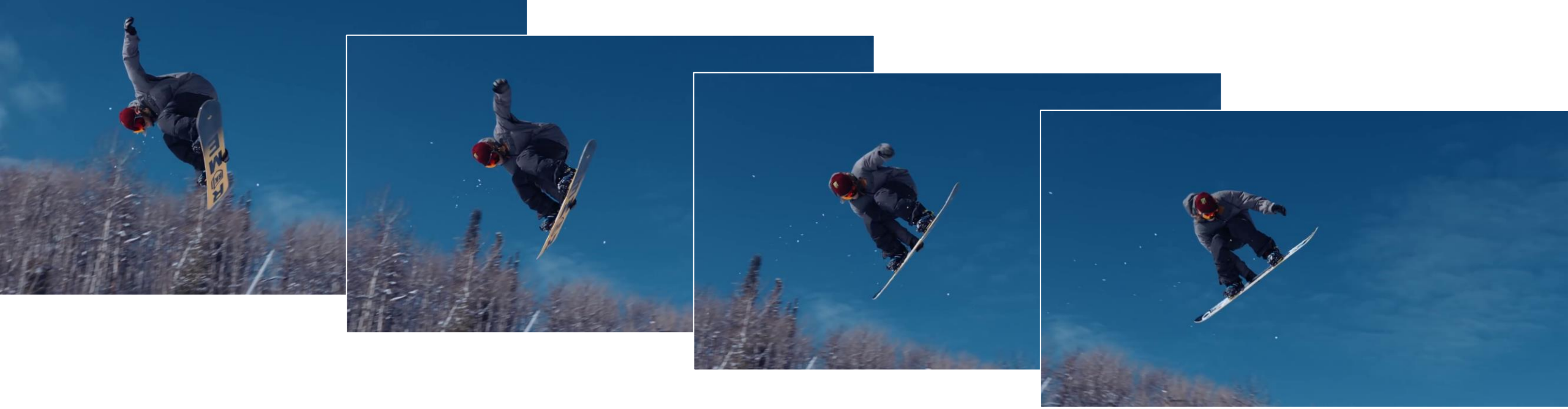

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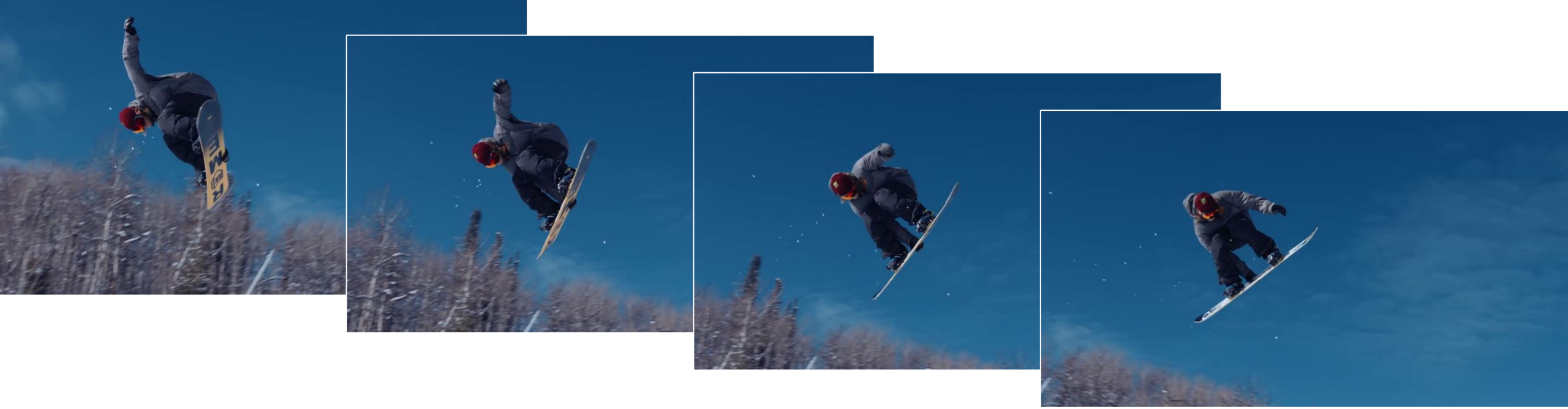

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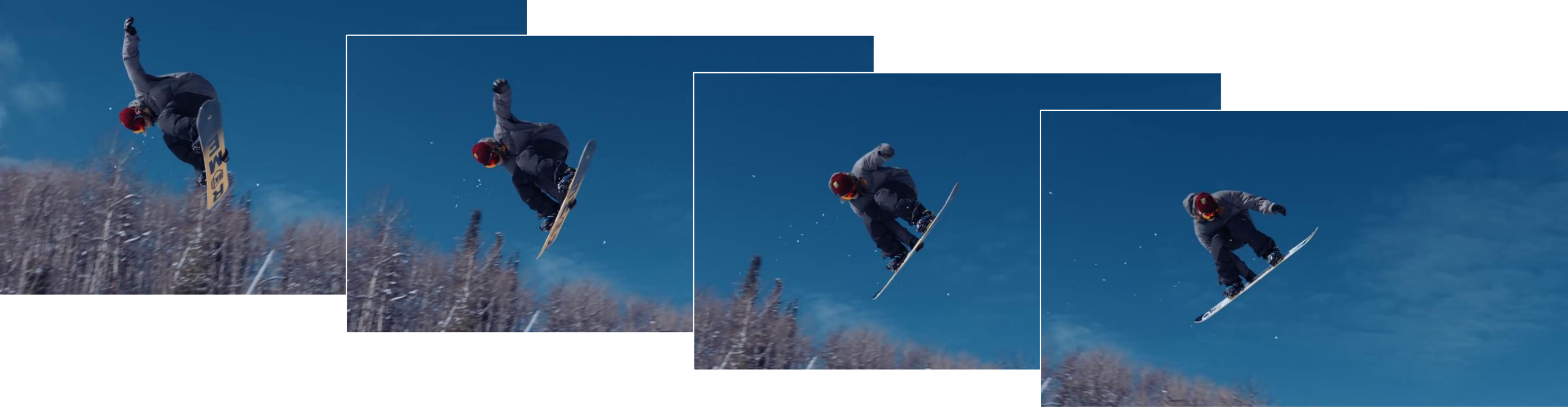
- 1 Second = 6.2 MB x 25 = 155 MB



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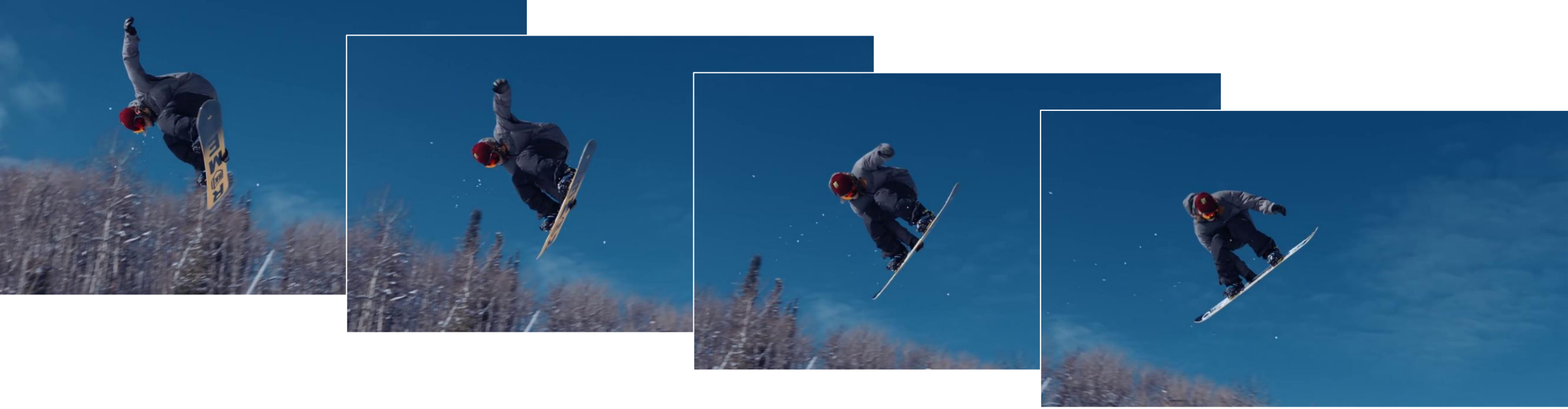

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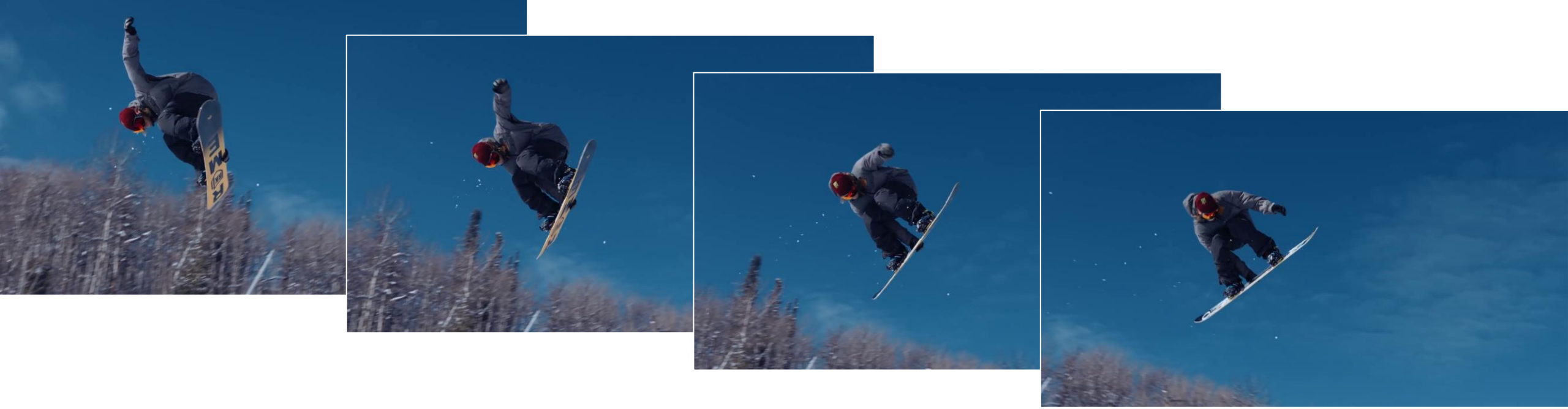
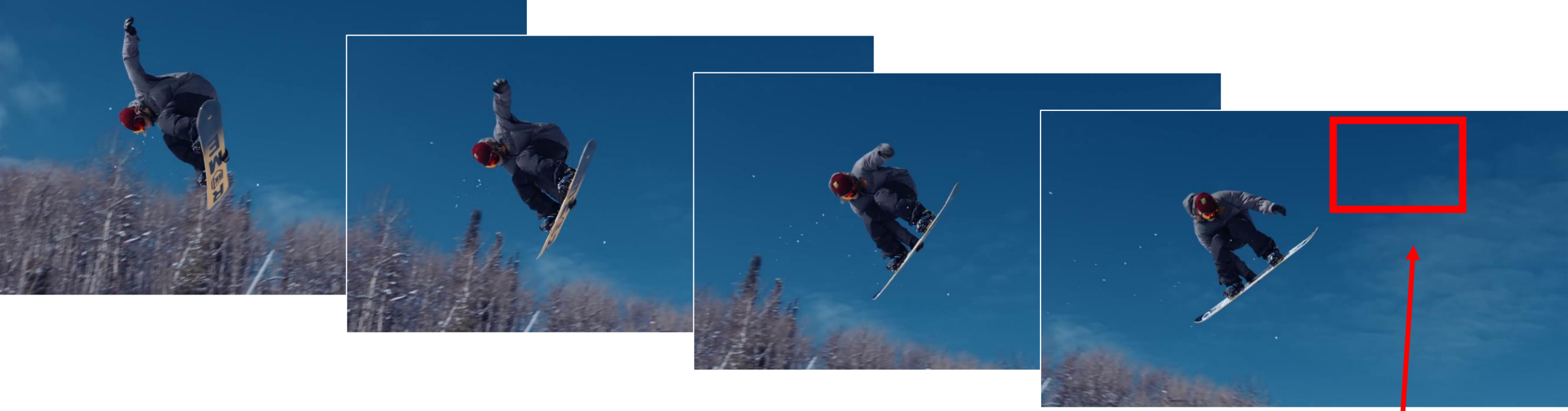
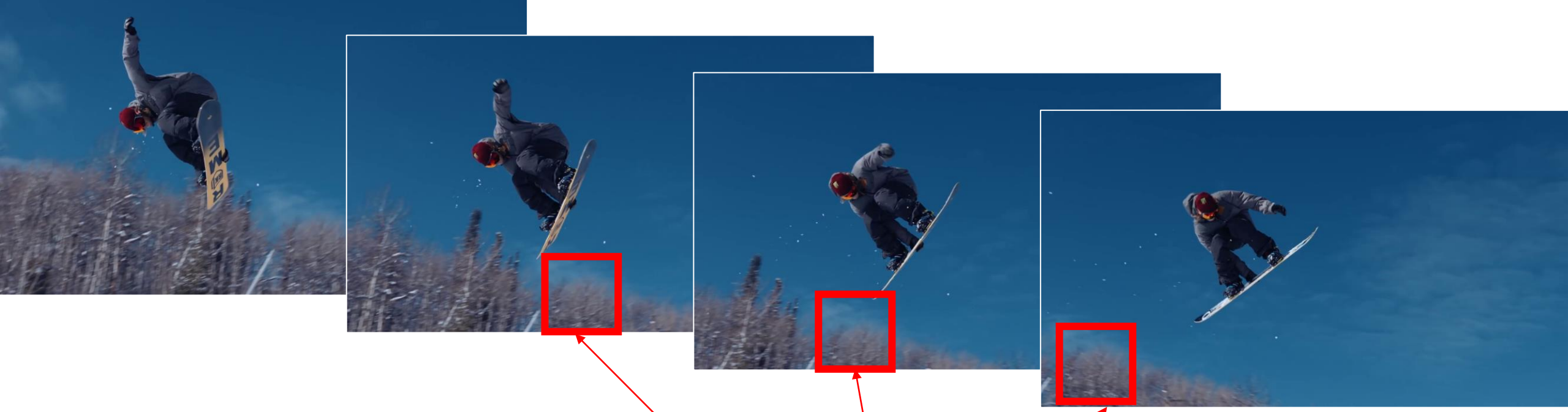
- 1 Minute = **9.3 GB**
- 1 Minute youTube compressed = 71.9MB



- In order to compress we need redundancy
  - Ability to present a lot of data with smaller amount of pixels/bits.. without loosing information (lossless)



Spatial Redundancy



Temporal redundancy

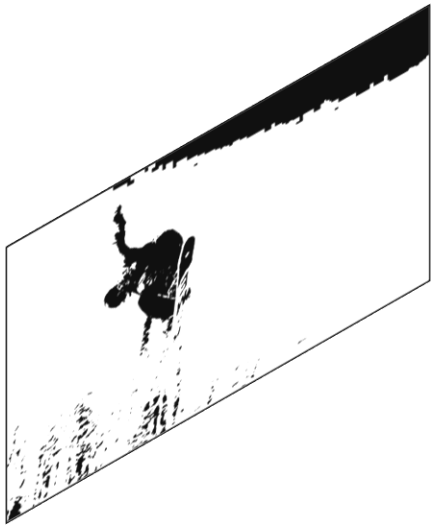
I frame

I frame

2 M pixels

I frame

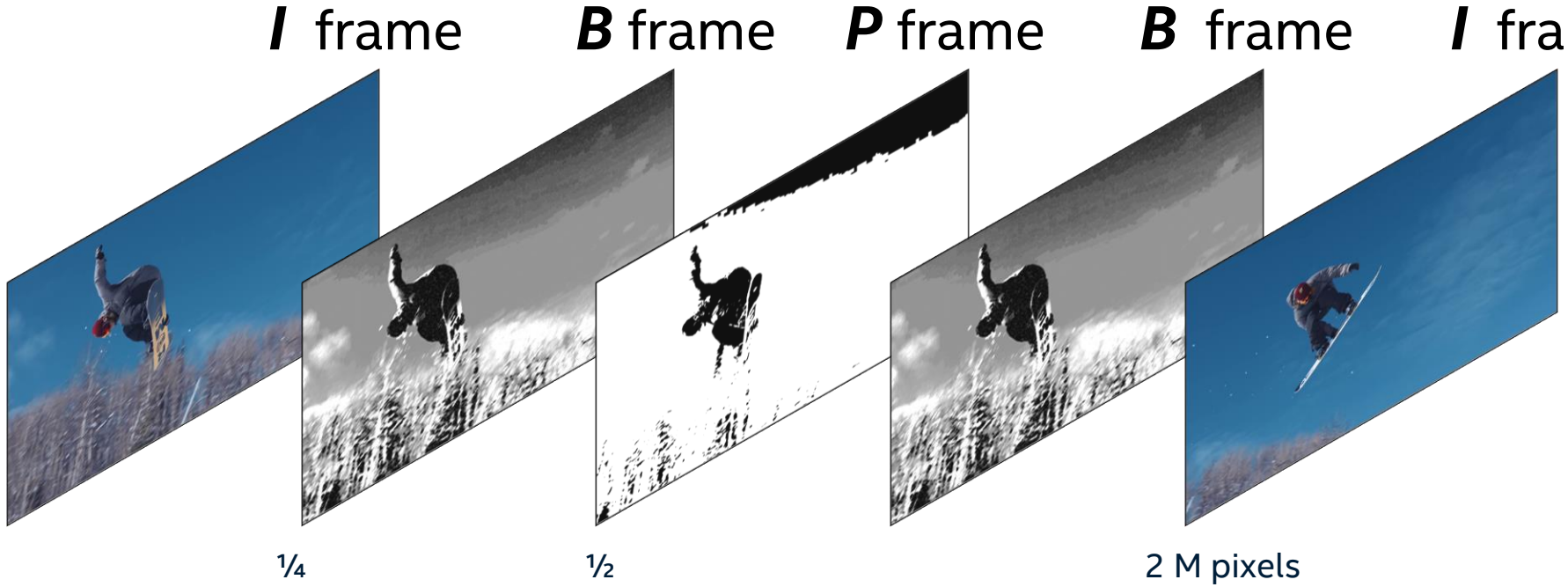
P frame

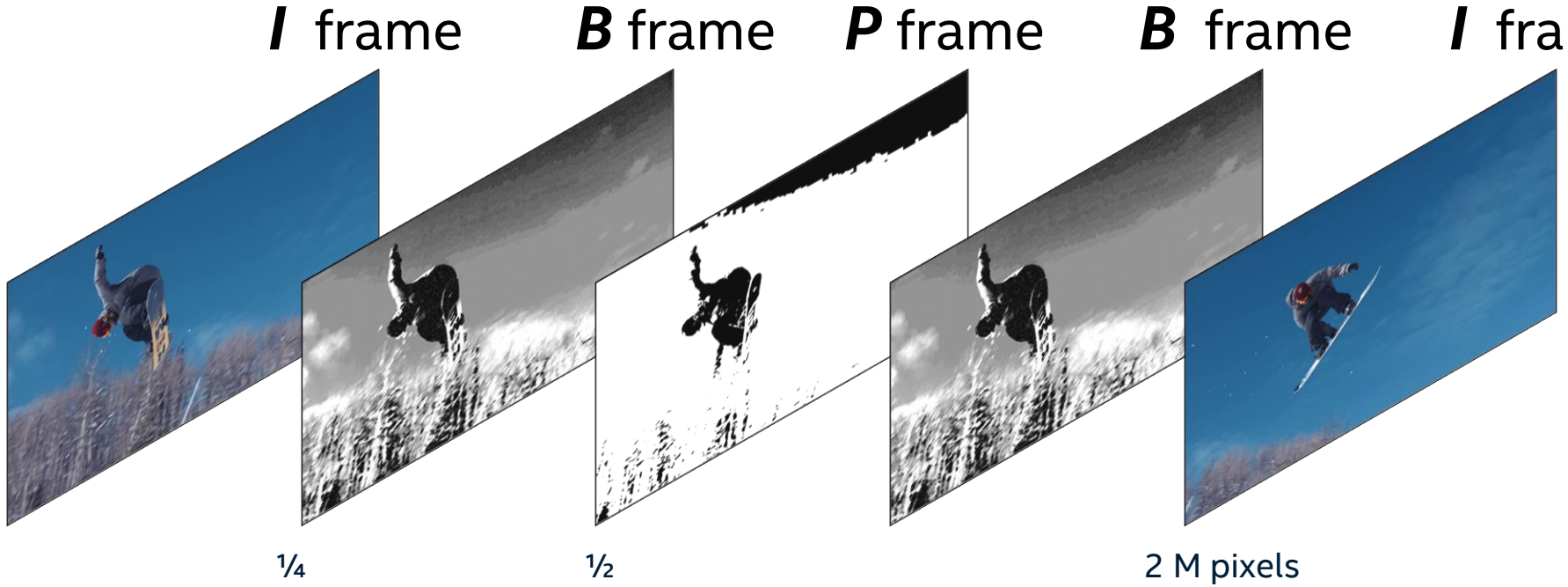


I frame

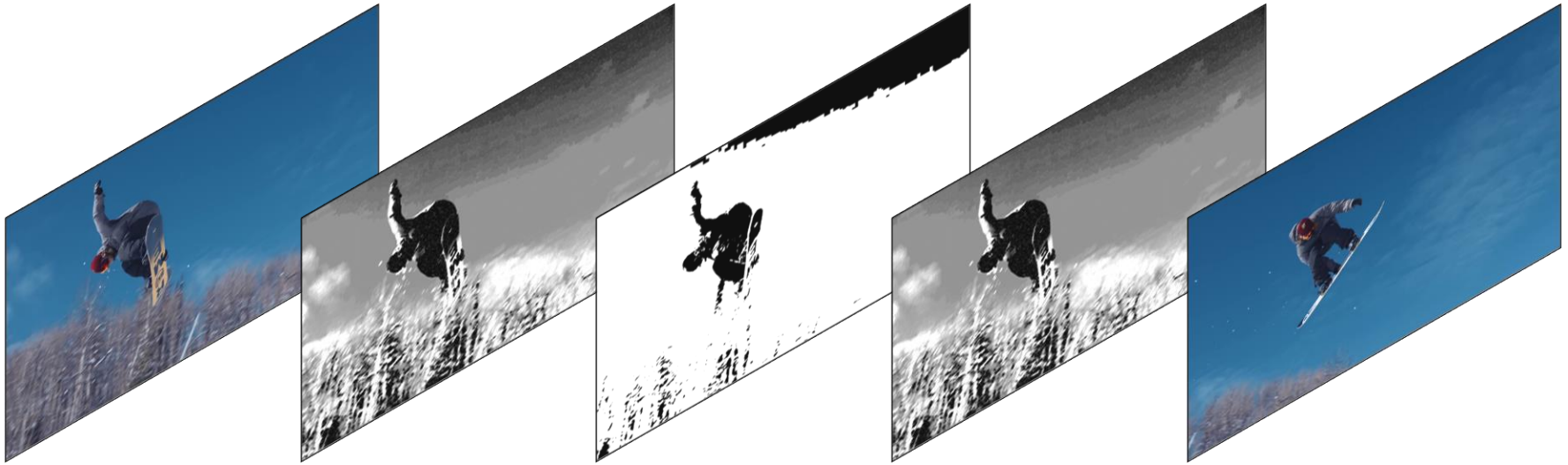
½ the data of “I frame”

2 M pixels

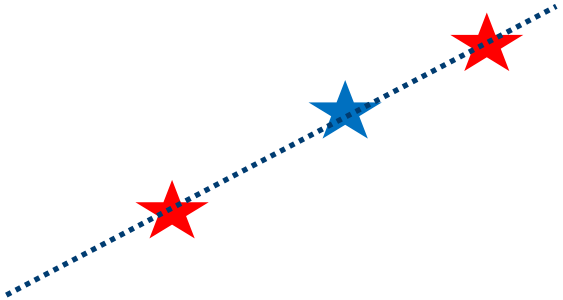

I frame
B frame
P frame
B frame
I frame
¼
½
2 M pixels

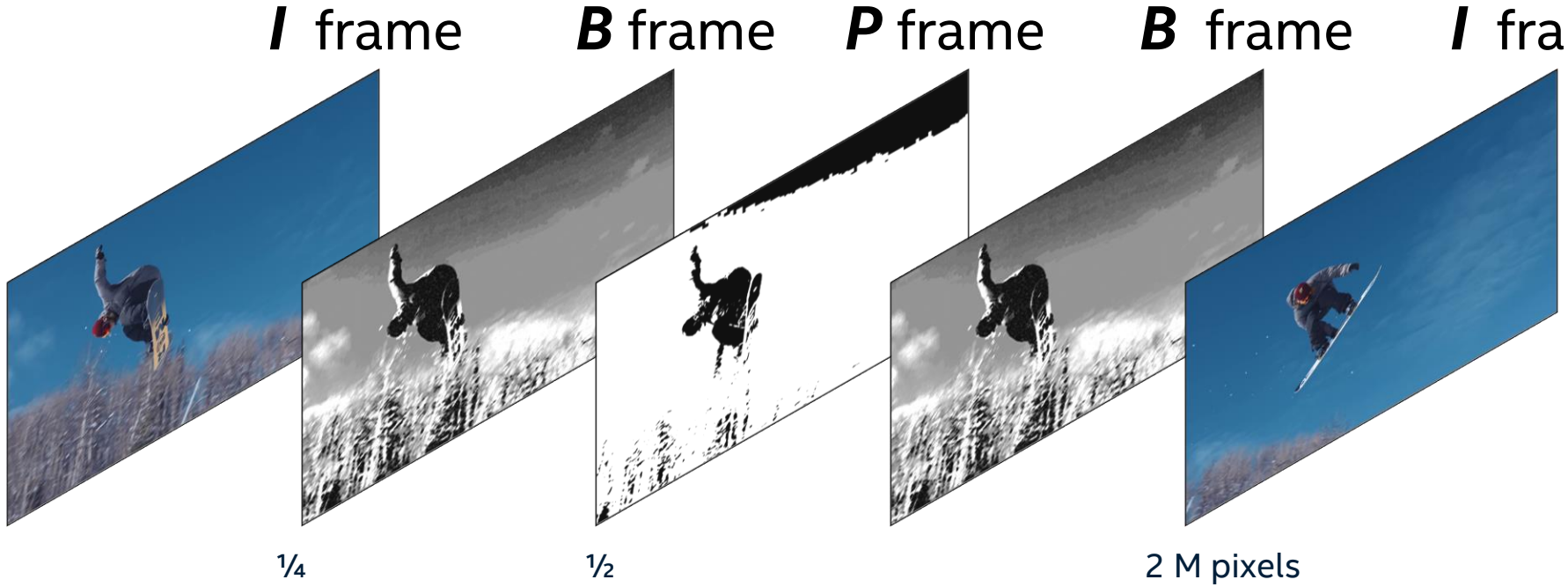

I frame
B frame
P frame
B frame
I frame
¼
½
2 M pixels

I frame ***B*** frame ***P*** frame ***B*** frame ***I*** frame



¼ ½ 2 M pixels




I frame
B frame
P frame
B frame
I frame
¼
½
2 M pixels

Encode
(Compress)

Decode
(Un-Compress)

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(Compress)

Decode
(Un-Compress)

CODEC

Video.**mp4**

container

Video Stream
h.264

Audio Stream
mp3

Meta Data
Bitrate, Resolution…
Codec

Accelerating Video Processing

Video Processing tasks

- Handling big buffers,
- high memory bandwidth, BITSTREAM decoder
- Fast images/pixels comparisons (motion vectors detection, redundancy detection..)
- Image processing tasks: scaling, denoising, color conversions..

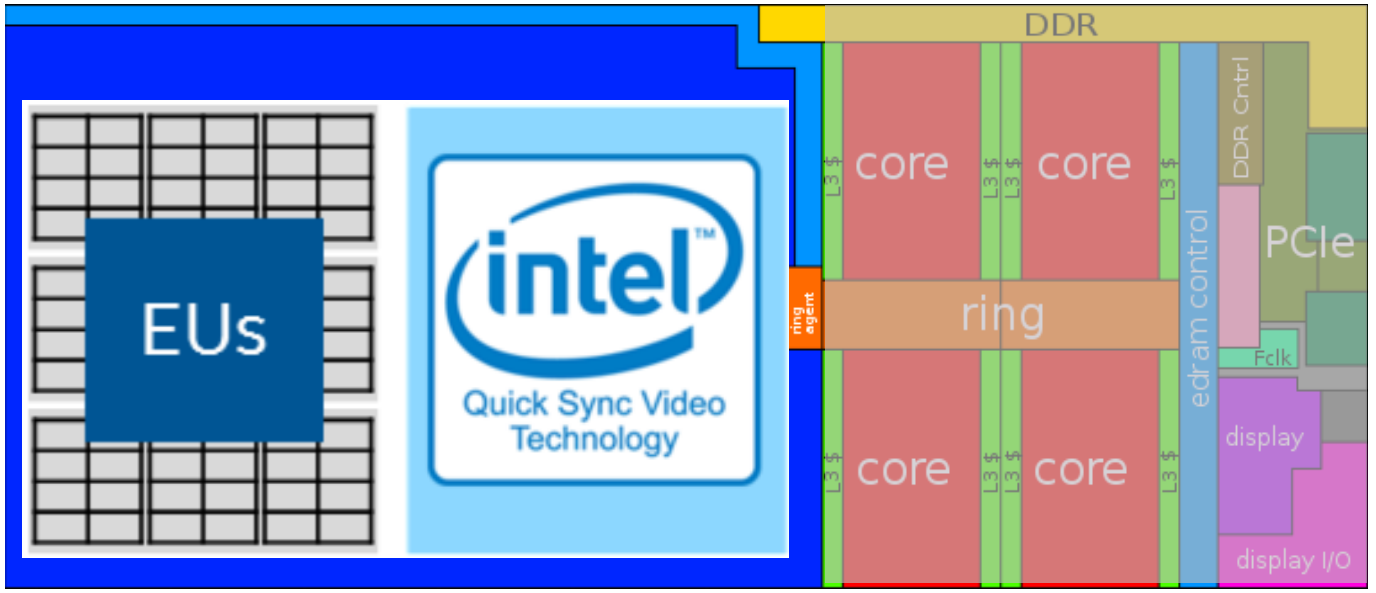
Accelerating Video Processing

Hardware

- Intel CPU can do a great job decoding/encoding
- BUT our iGPU has dedicated fixed functions for that.
  - They can do more, more efficiently
  - It's call Intel "**Quick Sync**"

Accelerating Video Processing

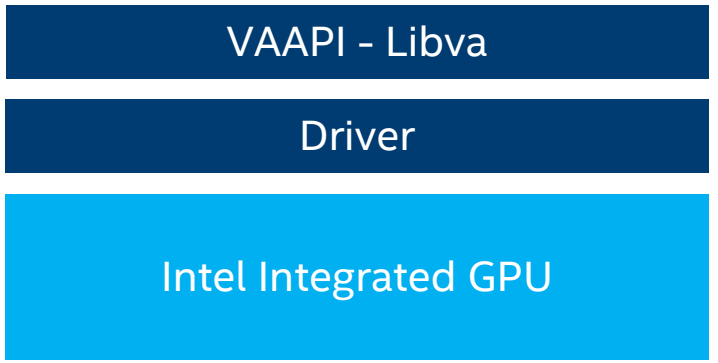
Intel integrated GPU



	Performance
Decode	**20x** 1080p30 AVC
Encode	**12x** 1080p30 AVC

Disclaimer : The benchmark results reported in this deck may need to be revised as additional testing is conducted. The results depend on the specific platform configurations and workloads utilized in the testing, and may not be applicable to any particular user's components, computer system or workloads. The results are not necessarily representative of other benchmarks and other benchmark results may show greater or lesser impact from mitigations. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks. Configuration: Intel® Core™ i7-8700(coffee lake) CPU @ 3.20GHz fixed, GPU GT2 (UHD Graphics 630)@ 1.20GHz fixed Internal ONLY testing, performed 12/10/2019 Test – Ubuntu* 16.04, OpenVINO™ 2019 R3. Tests were based on various parameters such as model used (these are public), batch size, and other factors. Different models can be accelerated with different Intel hardware solutions, yet use the same Intel software tools. Benchmark Source: Intel Corporation.

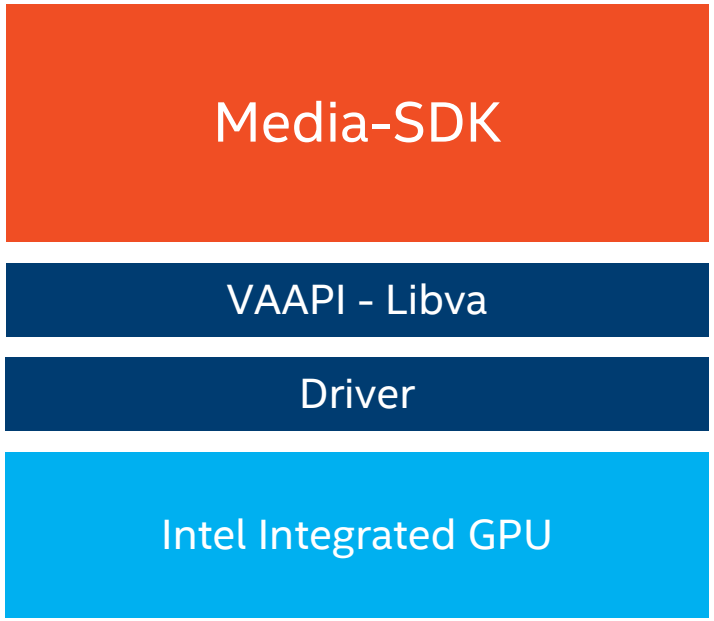
Accelerating Video Processing



Accelerating Video Processing

Media-SDK

- Cross OS, cross-platform, open source
- Better performance & quality
- API (C++/Python)
- Decode/Encode/Resize/Convert/Compare ….
- Accelerated on Intel integrated **GPU**



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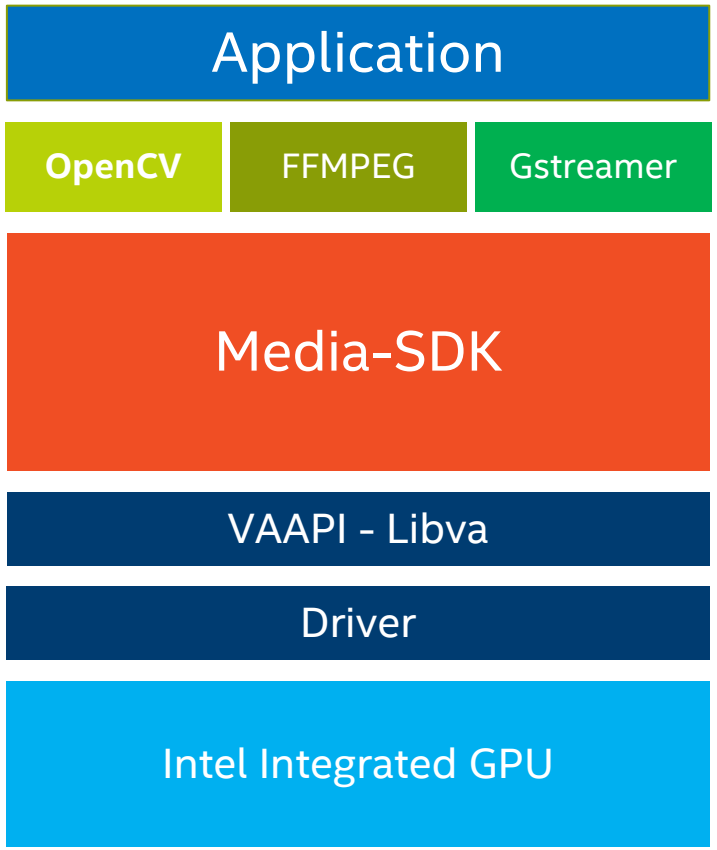
- Easy access using OpenCV, FFMPEG, Gstreamer



Intel® Distribution of OpenVINO™ toolkit

Traditional Computer Vision

Optimized Libraries & Code Samples

OpenCV* | **OpenVX*** | **Samples**

For Intel® CPU & GPU/Intel® Processor Graphics

Tools & Libraries

Increase Media/Video/Graphics Performance

Intel® Media SDK
Open Source version

OpenCL™ Drivers & Runtimes

For GPU/Intel® Processor Graphics

Optimize Intel® FPGA (Linux* only)

FPGA RunTime Environment
(from Intel® FPGA SDK for OpenCL™)

Bitstreams

Intel® Architecture-Based Platforms Support

Intel® Vision Accelerator Design Products & AI in Production/ Developer Kits

OS Support: CentOS* 7.4 (64 bit), Ubuntu* 16.04.3 LTS (64 bit), Microsoft Windows* 10 (64 bit), Yocto Project* version Poky Jethro v2.0.3 (64 bit), macOS* 10.13 & 10.14 (64 bit)

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- **Media-SDK** is part of **OpenVINO**