

# GSOC 2019 Ideas

Projects that we maintain:

- SOF: <https://github.com/thesofproject>
- FFmpeg-QSV: QSV in <https://ffmpeg.org/>
- gstreamer-vaapi: <https://cgit.freedesktop.org/gstreamer/gstreamer-vaapi/>
- gstreamer-MediaSDK: <https://cgit.freedesktop.org/gstreamer/gst-plugins-bad/tree/sys/msdk>
- libyami: <https://github.com/intel/libyami>
- libyami-utils: <https://github.com/intel/libyami-utils>
- libxcam: <https://github.com/intel/libxcam>
- libva: <https://github.com/intel/libva>
- libva-utils: <https://github.com/intel/libva-utils>

Projects where we actively participate:

- HW acceleration in OpenCV: <https://github.com/opencv/opencv>
- FFmpeg vaapi and filters
- Gstreamer plugins

LIST OF PROJECT IDEAS:

SOF

## **Improve SOF topology generator usability.**

Description: To optimize or design a more user friendly topology generator. At this time, the topology generator (<https://github.com/thesofproject/sof/tree/master/tools/topology>) is written by M4 and the macro language is hard to debug and use. Writing some scripts to make a generator would make generating a topology more easy to debug and user friendly.

Difficulty: Medium

Skill Required: C, Python, Bash, or other scripts language.

Optional Skills: Familiar with ALSA topology ([https://www.alsa-project.org/main/index.php/ALSA\\_topology](https://www.alsa-project.org/main/index.php/ALSA_topology))

Hardware required: SOF support Intel PC

Possible mentor:

Sridharan, Ranjani ([ranjani.sridharan@intel.com](mailto:ranjani.sridharan@intel.com))

Pan, Xiuli ([xiuli.pan@intel.com](mailto:xiuli.pan@intel.com))

## **Port SOF to the ESP32 SoC.**

Description: ESP32 is a popular SoC, featuring WiFi and Bluetooth Low Energy for connectivity, as well as a number of additional peripherals and audio DSP functionality. The SoC is produced by Espressif and is based on the Xtensa LX6 dual-core CPU from Cadence. It belongs to the same architecture as all other DSPs, on which SOF is already running. The result of this project should be running SOF on one of ESP32-based audio kits like <https://www.espressif.com/en/products/hardware/esp32-lyratd-msc> and enabling as much of its functionality as possible.

Difficulty: Medium

Skill Required: C, embedded

Optional Skills: assembly, hardware

Hardware requirement: one of ESP32-based audio kits, can be purchased upon project begin  
Possible Mentor: Liakhovetski, Guennadi ([guennadi.liakhovetski@intel.com](mailto:guennadi.liakhovetski@intel.com))

## LibXCam

### **Improve Defog/Dehaze quality and performance**

Description: To design and tune algorithm based on Dark Channel Prior to improve image quality, especially on Halo removal and color balance. Also need to consider performance improvements based on OpenCL/vulkan/gles in IA platform.

Difficulty: Medium

Skill Required: C/C++, OpenCL

Optional Skills: Familiar with image processing

Hardware required: Intel Skylake+ based PC

Possible mentor: Zong, Wei ([wei.zong@intel.com](mailto:wei.zong@intel.com))

### **Enable HDR based on different exposure images**

Description: To investigate HDR algorithms based on 2 or 3 Low, (mid), long exposure images into one clear image. Enable the HDR feature into libxcam (<https://github.com/01org/libxcam>). Performance improvements based on Intel CPU/GPU also need to be considered.

Difficulty: Medium

Skill Required: C/C++/OpenCL

Optional Skills: OpenCL/OpenCV/Image processing algorithm.

Hardware Requirement: Intel Skylake+ based PC

Possible mentor: Zong, Wei ([wei.zong@intel.com](mailto:wei.zong@intel.com))

### **Super resolution from low resolution images**

Description: To investigate super resolution algorithms from low resolution images while keeping a clear edge. Implement the feature into libxcam (<https://github.com/01org/libxcam>). Parallel computing (OpenCL) for performance must be considered.

Difficulty: Medium

Skill Required: C/C++/OpenCL

Optional Skills: OpenCL/Image processing algorithm.

Hardware Requirement: Intel Skylake+ based PC

Possible mentor: Zong, Wei ([wei.zong@intel.com](mailto:wei.zong@intel.com))

### **Title: Add face anti-spoofing function for libxcam**

Description: Design and implement an face anti-spoofing solution by using DNN technique and Intel RealSense camera. Add related APIs into libxcam. Cook a sample program to use anti-spoofing API.

Difficulty: Medium

Skill Required: C/C++/python

Optional Skills: OpenCL/OpenCV/Image processing algorithm.

Requirement: Intel Skylake+ based PC, Intel RealSense camera

Possible mentor: Wu, Zhiwen ([zhiwen.wu@intel.com](mailto:zhiwen.wu@intel.com)) Zong, Wei ([wei.zong@intel.com](mailto:wei.zong@intel.com))

## OpenCV

### **Enable Vaapi based HEVC/AVC HW decoder in OpenCV-FFmpeg plugin**

Description: OpenCV-FFmpeg plugin uses software ffmpeg decoder and vpp. Changing it to hardware-based will speed up the process. We can enable HEVC/AVC HW decoder in OpenCV to

add values for video operations.

Difficulty: Medium

Skill Required: C, ffmpeg

Optional Skills: git, c++, Codec knowledge

Hardware requirement: Intel CPU with integrated GPU since Haswell

Possible mentor:

Xu, Guangxin ([Guangxin.Xu@intel.com](mailto:Guangxin.Xu@intel.com))

Li, Zhong ([zhong.Li@intel.com](mailto:zhong.Li@intel.com))

Wu, Zhiwen ([zhiwen.wu@intel.com](mailto:zhiwen.wu@intel.com))

### **OpenCV DNN Vulkan backend optimization**

Description: Since OpenCV 4.0, a Vulkan-based backend was included in OpenCV DNN module. It uses the Vulkan compute shader to accelerate the DNN operations. For now, it is just a experimental work and has a lot of room for improvement. This project will improve the Vulkan backend performance by providing a more efficient compute shader and implementing layer fusion for the Vulkan backend.

Difficulty: Medium

Skill Required: C++, Vulkan, GLSL, DNN knowledge

Optional Skills: git

Hardware requirement: Intel CPU with integrated GPU

Possible mentor: Wu, Zhiwen ([zhiwen.wu@intel.com](mailto:zhiwen.wu@intel.com))

Gstreamer

### **Enable vaapi based hw decoder on gst-libav**

Description:Gst-libav is an important component in gstreamer. Gstreamer use it to decode/encode almost all video formats in world. However, after many years development, gst-libav still can't support hw codec. Let us identify the gap and provide necessary patch to fill this gap. The student need modify the gst-libav/gstreamer code to enable hw decoder in gst-libav. The implementation must not copy memory from decoder to renderer(zero copy)

Difficulty: Hard

Skill Required: C, gstreamer

Optional Skills: git

Hardware requirement: Intel CPU with integrated GPU since Haswell

Possible Mentor:

Xu Guangxin <[Guangxin.Xu@intel.com](mailto:Guangxin.Xu@intel.com)>

Xiang, Haihao<[Haihao.Xiang@intel.com](mailto:Haihao.Xiang@intel.com)>

### **Bug fixing and feature development on gst-vaapi**

Description: Help us to reduce the bug count. We have 100+ open bugzilla items: <https://gitlab.freedesktop.org/gstreamer/gstreamer-vaapi/issues>. Not all of them are bugs, many are feature requests from customers.

Difficulty: Medium

Skills Required: C

Useful skills: Some understanding of Multimedia, Video in general

Hardware requirement: Intel CPU with integrated GPU since Haswell

Possible mentors:

Xiang, Haihao ([haihao.xiang@intel.com](mailto:haihao.xiang@intel.com))

Balachandran, Sreerenj ([bsreerenj@gmail.com](mailto:bsreerenj@gmail.com), [sreerenj.balachandran@intel.com](mailto:sreerenj.balachandran@intel.com))

He, Junyan ([junyan.he@intel.com](mailto:junyan.he@intel.com))

Wang, Fei ([fei.w.wang@intel.com](mailto:fei.w.wang@intel.com))

### **Bug fixing and feature development on gst-msdk**

Description: Media SDK (<https://github.com/Intel-Media-SDK/MediaSDK>) is Intel's Software library for media acceleration. We are maintaining the GStreamer plugins for Media SDK (<https://cgit.freedesktop.org/gstreamer/gst-plugins-bad/tree/sys/msdk>). This is still in the early stages of development and there are many opportunities for bug fixing, feature development, and performance improvements. Please let us know if you are interested in working on this.

Difficulty: Medium

Skills Required: C

Useful skills: Some understanding of Multimedia, Video in general

Possible mentors:

Xiang, Haihao ([haihao.xiang@intel.com](mailto:haihao.xiang@intel.com))

Balachandran, Sreerenj ([bsreerenj@gmail.com](mailto:bsreerenj@gmail.com), [sreerenj.balachandran@intel.com](mailto:sreerenj.balachandran@intel.com))

He, Junyan ([junyan.he@intel.com](mailto:junyan.he@intel.com))

Wang, Fei ([fei.w.wang@intel.com](mailto:fei.w.wang@intel.com))

### **GStreamer: Add VMAF filter as plugin in the GStreamer**

Description: VMAF(<https://github.com/Netflix/vmaf>) is a tool to measure and perceive the video quality subjectively. It is similar to SSIM/PSNR. FFmpeg has this as a filter by now.

Integrate VMAF as the GStreamer-Plugin.

Difficulty: Medium

Skill Required: C/C++

Optional Skills: knowledge about GStreamer

Hardware requirement: No

Possible mentor:

Xiang, Haihao ([haihao.xiang@intel.com](mailto:haihao.xiang@intel.com))

Xu, Guangxin ([Guangxin.Xu@intel.com](mailto:Guangxin.Xu@intel.com))

Victor Jaquez ([vjaquez@igalia.com](mailto:vjaquez@igalia.com))

Hyunjun Ko ([hko@igalia.com](mailto:hko@igalia.com))

### LibYami

#### **Improve libyami based on iHD driver**

Description: Libyami development was based on the i965 driver, so there are many gaps if co-working with the iHD driver. The target is to improve decoding/encoding/video processing pass rate for libyami co-working with iHD driver. Also to add missing features in libyami that can be supported in iHD driver, such as ICQ/QVBR encoding modes and rotation/tonemapping filters.

Difficulty: Medium

Skill Required: C/C++

Optional Skills: git/decoding/encoding/video processing knowledge

Hardware requirement: Intel CPU with integrated GPU since Skylake

Possible mentor:

Li, Zhong ([zhong.li@intel.com](mailto:zhong.li@intel.com))

Xu, Guangxin ([Guangxin.Xu@intel.com](mailto:Guangxin.Xu@intel.com))