Suggested Project Topics

1. **Rate-Distortion Optimized Audio/Image/Video Coding.** Optimize the performance of popular audio/image/video compression algorithms. Develop various novel approaches to encode multimedia.

2. **Scalability.** The ability to deliver digital video to various customers with different connection bandwidth and computing resources using the same compressed bitstream is very valuable. Study various scalability techniques for multimedia coding: SNR scalability, spatial scalability, and/or temporal scalability.

3. **Transcoding.** Investigate fast intelligent algorithms to convert multimedia from one format to another at possibly different resolution, frame rate, quality level, etc.

4. **Medical Applications.** Explore multimedia techniques in medical applications such as telemedicine, region-of-interest coding/decoding, motion analysis, database retrieval...

5. **3D Transform-Based Video Coding.** Implement video coding algorithms with 3D filter banks: 3D DCT cube coding, 3D embedded wavelet video coding...

6. **Lossless Video Coding.** Design and implement a high-performance lossless video codec with integer-mapping transforms and/or predictive coding.

7. **Motion Estimation.** Study fast and efficient motion estimation techniques, for example with adaptive and variable block size.

8. **Video Coding for Handheld PDAs.** Implement an ultra-fast MPEG1/MPEG2/H.263+ video decoder for Palms, PocketPCs, cell phones.

9. **Multimedia Java Demo.** Implement simple java demonstrations of multimedia coding / processing algorithms.

10. **Fast Implementations.** Can we take advantage of current technologies to obtain the fastest coding/decoding time? How about a simplified MMX-optimized video codec? How about multi-thread multimedia coding/decoding?

11. **Signal Processing in the Compressed Domain.** Can you crop, upsample, downsample, transpose, filter, detect... audio/image/video signals directly in the compressed format (MP3/JPEG/MPEG)?

12. **Fast Video Database Retrieval.** Can archiving and fast retrieving a video from a large database be achieved by simply comparing a few transform coefficients and motion vectors?
13. **Digital Watermarking and Data Hiding.** Can we hide robust invisible data for verification and authentication purposes in the compressed bitstreams?

14. **Streaming and Communication Applications.** Investigate multimedia streaming algorithms, concealment, robust protection in lossy communication channels. Wireless multimedia applications.