**Project Proposal**

Project Title**:** Deep learning based basketball video analysis for intelligent arena application

Team#3: Threem Team

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**Project Goal and Objectives**

**1, Motivation**

As the great improvement of multimedia communication and artificial intelligence, the application on the smartphone becomes more and more interesting. People want to get any exciting moments with their cameras or smartphones. But most applications are used for taking charming scenery or selfie. For many sports fans, they also want to get highlight moment when they are playing with team members. The "Intelligent Arena" will be a new type of application.

**2, Significance/Uniqueness**

The application on the smartphones is easy to find and use. People can record their sports moment anywhere and anytime, also people don't need extra spend. The technologies of deep learning can generate many new functions. The highlight detection can analysis the video to catch the highlight by itself. People can easier and faster share their highlight moment with their friends or social network.

**3, Objectives**

In order to get highlight video, the system has to automatically select highlight video clips in real-time living camera. The most important work is how to recognize the highlight moment and save it. To sum up, this paper has the follows four points:

1, how to find and match the broadcast in the playground.

2, recognizing and saving the shoot and scoring moment in living camera.

3, decreasing the influences of the background the lighting

4, save those scoring moment into highlight video.

Most of those works need to train a deep convolutional neural network.

**4, System Features**

From the paper we reference, the system will have 4 features to Implement the real-time match broadcast. The system can detect the basketball matches, then produce highlight videos and transfer scoring clips timely.

1)The pyramid histogram features, which can choose the best record video of match and decrease the influence of the background, complex lighting and different player motions.

2)The aggregate channel features, which can detect the backboard and basketball hoop as the central spot area.

3)The basketball energy image, which will accurately record the basketball track in the central spot area the system build.

4)Convolutional Neural Network, which can detect the basketball shoot and scoring moment in real-time.

**Related Work**

1 In the field of audio-based methods

[1] Baillie M, Jose JM (2003) Audio-based event detection for sports video. In: CIVR, pp 300–309

URL:<https://pdfs.semanticscholar.org/bb30/8c656104a833e8edc88219953211277a2a7a.pdf>

[2] Xiong Z, Radhakrishnan R, Divakaran A, Huang TS (2003) Audio events detection based highlights extraction from baseball, golf and soccer games in a unified framework. In: IEEE ICASSP, pp 632–635

URL:<http://ieeexplore.ieee.org/document/1200049/>

[3] Xu M, Maddage NC, Xu C, Kankanhalli MS, Tian Q (2003) Creating audio keywords for event detection in soccer video. In: IEEE ICME, pp 281–284

URL:<http://ieeexplore.ieee.org/document/1221608/>

2 In the field of motion-based methods

[4] Ekin A, Tekalp AM, Mehrotra R (2003) Automatic soccer video analysis and summarization. IEEE Trans Image Process 12(7):796–807

URL:<http://ieeexplore.ieee.org/document/1212655/>

[5] Pan H, van Beek PJL, Sezan MI (2001) Detection of slow-motion replay segments in sports video for highlights generation. In: IEEE ICASSP, pp 1649–1652

URL:<http://ieeexplore.ieee.org/document/941253/>

3 In the field of object and people detection-based methods

[6] Hsu C, Chen H, Chou C, Ho C, Lee S (2014) Trajectory based jump pattern recognition in broadcast volleyball videos. In: ACM MM, pp 1117–1120

URL:<https://dl.acm.org/citation.cfm?id=2654985>

4 In the field of search-based methods

[7] Chu L, Jiang S, Wang S, Zhang Y, Huang Q (2013) Robust spatial consistency graph model for partial duplicate image retrieval. IEEE Trans Multimedia 15(8):1982–1996

URL:<http://ieeexplore.ieee.org/document/6544623/>

[8] Sun M, Farhadi A, Seitz S (2014) Ranking domain-specific highlights by analyzing edited videos. In: ECCV, pp 787–802

URL:<https://pdfs.semanticscholar.org/5c7a/dde982efb24c3786fa2d1f65f40a64e2afbf.pdf>

[9] Yang H, Wang B, Lin S, Wipf D, Guo M, Guo B (2015) Unsupervised extraction of video highlights via robust recurrent auto-encoders. In: IEEE ICCV, pp 4633–4641

URL:[https://www.cv-foundation.org/openaccess/content\_iccv\_2015/papers/Yang\_Unsupervised\_Extraction\_of\_ICCV\_2015\_paper.pdf](https://www.cv-foundation.org/openaccess/content_iccv_2015/papers/Yang_Unsupervised_Extraction_of_ICCV_2015_paper.pdf%20)

5 This paper authors’ previous intelligent basketball arena work

[10] Liu W, Liu J, Gu X, Liu K, Dai X, Ma H (2017) Deep learning based intelligent basketball arena with energy image. In: MMM, pp 601–613

URL: <https://link.springer.com/chapter/10.1007/978-3-319-51811-4_49>