Mentor: Dr. Humera Tariq
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DICE-DUHS INNOVATION COMPETITION

Intelligent Bone Guard (IBG) System

EXECUTIVE SUMMARY:

Knee Osteoarthritis(OA) is one of most common and prevalent joint disease in elderly people especially women all over the world. According to Osteoarthritis Research Society International (OARSI) approximately 30 million US adults have been affected by OA. According to recent statistic Pakistan has been facing severely increase in OA rate due to lack in nutrition and health care services. According to research statistics In the Asian region the prevalence of knee OA was 3.1–4.6% in urban and 3.6% in rural north Pakistan, 7.5% in rural and 10.6% in urban Bangladesh, 5.78% in rural western India, and 12.2% in urban and 5.1% in rural North India (Lucknow).

In developing countries specially Pakistan, all giant hospitals rely on commercial software's for imaging and biomedical equipment.

THE IDEA to SOLVE THE PROBLEM:

Image Processing, artificial intelligence and machine learning techniques can be used on Knee radiographs and MR Images to measure Joint Space Width (JSW) between femorotibial (FT) knee joint so that osteoarthritis can be diagnosed and more importantly can be classified to determine its progression by comparing it with available gold standards.

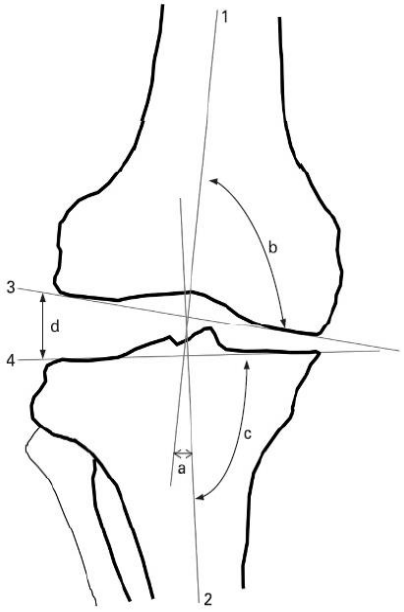
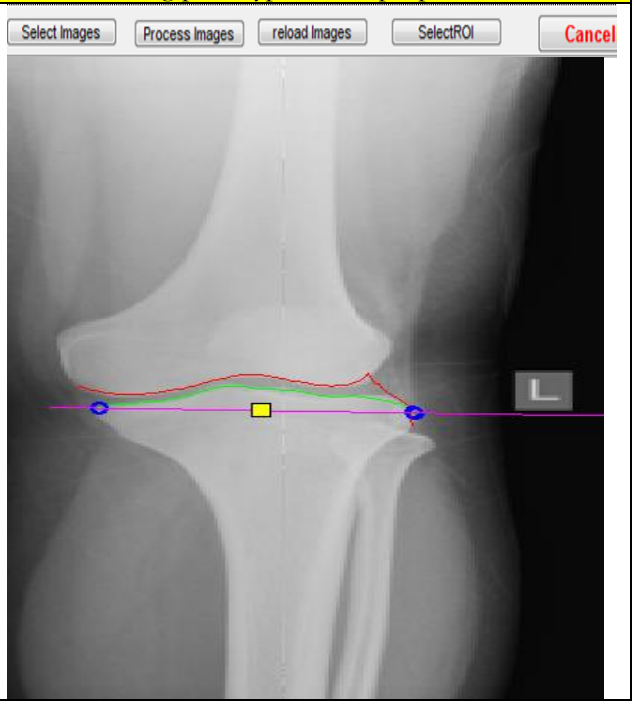
Structural Information about Knee	The working prototype of our proposed solution
	

Figure 1 Drawing of a typical varus knee. (1) Femoral anatomic axis line. (2) Tibial anatomic axis line. (3) Condylar line. (4) Tibial plateau line. (a) Anatomic axis angle. (b) Condylar angle. (c) Tibial plateau angle. (d) Condylar–plateau angle.	Our software allow user to input DICOM image and then use Image processing and machine learning to measure and draw important land markers of Knee for OA diagnostic.

IDEA BENEFIT/DIFFERENTIATOR:

Medical image processing has already been an establish science in developed world but unfortunately in Pakistan no one has acknowledge its true importance in both Education, research and Industry Sector. Clinical trial has been sponsored by NIH and other organizations to address this challenge.

There is a huge space to work in development of economic software for medical image analysis. This open new fields for learning in medical sciences. Doctors, Radiologists and Computer Scientist work to gather to find solutions of many health related problems. Smart and Intelligent health care systems can be developed. Any strong and serious initiative in this regard will be revolutionary with respect to economy and advancement in medical sciences.

TARGET MARKET

Our target industry are Hospitals, Medical Universities, research labs and radiology software industry. As a matter of fact, one cannot escape from OA so the marker is ever growing. A number of laboratories and research centers are not only involved to manufacture novel drugs; they are creating ways to diagnose OA at a very early stage to control its progression. More Work is in progress to set standard biomarker for OA (Duke University). Decision making for Joint replacement is a die hard decision for both patient and surgeon. Hence a variety of technological advancement are in progress.

According to the report, the global osteoarthritis treatment market is expected to register a CAGR of 4.8% from 2017 to 2025. In 2017, the market was valued at US$ 7,969.7 Mn and is expected to rise to a valuation of US$ 11,618.6 Mn by the end of 2025.

https://www.persistencemarketresearch.com/market-research/osteoarthritis-market.asp.

Epidemiology Forecast to 2024 is a market research study that provides an overview of the risk factors, comorbidities, and the global and historical trends for hand OA, knee OA, and hip OA in the seven major markets (7MM) (US, France, Germany, Italy, Spain, UK, and Japan). Epidemiologists forecast an increase in the total prevalent cases of hand OA in the 7MM from 151,439,533150,635,612 total prevalent cases in 2014 to 176,143,154175,213,683 total prevalent cases in 2024 at an AGR of 1.63% during the forecast period. Epidemiologists forecast that the total prevalent cases of knee OA in the 7MM are expected to increase from 110,840,501 total prevalent cases in 2014 to 127,929,359 total prevalent cases in 2024 at an AGR of 1.54% during the forecast period. Epidemiologists forecast that the total prevalent cases of hip OA in the 7MM are expected to increase from 61,150,916 total prevalent cases in 2014 to 69,699,696 total prevalent cases in 2024 at an AGR of 1.4% during the forecast period.

The diagnosed prevalent cases of hand OA in the 7MM are expected to increase from 61,045,59060,125,229 diagnosed prevalent cases in 2014 to 70,996,37570,072,690 diagnosed prevalent cases in 2024 at an AGR of 1.635% during the forecast period. The diagnosed prevalent cases of knee

OA in the 7MM are expected to increase from 37,845,305 diagnosed prevalent cases in 2014 to 43,877,213 diagnosed prevalent cases in 2024 at an AGR of 1.59% during the forecast period. The diagnosed prevalent cases of hip OA in the 7MM are expected to increase from 15,116,094 diagnosed prevalent cases in 2014 to 17,276,030 diagnosed prevalent cases in 2024 at an AGR of 1.43% during the forecast period. https://www.prnewswire.com/news-releases/osteoarthritis-market-hand-knee--hip-oa-2024-forecasts-for-7-major-markets-570048861.html

Competition

As per our observation, little work has been done in Pakistan. So the idea is quite original, innovative and can be pitched into market in near future.

Future Milestone

To develop a full prototype of a tool that can assist in diagnostics of Osteoarthritis by measuring JSW and to extend it for Knee alignment problem diagnostic. The prototype can then be worked as fully featured suggestion system especially for surgeons of knee and hip replacement. The software can also assist radiologist and doctors in reporting.

THE TEAM:

Mentor and Concept: Dr. Humera Tariq

(1) Humera Bashir
(2) Saad Bin Sami
(3) Kazim Hussain
(4) Isbah Badar
(5) Talib Waseem

REQUEST/RESOURCES REQUIRED:

Will be furnished if Idea get selected and approved.