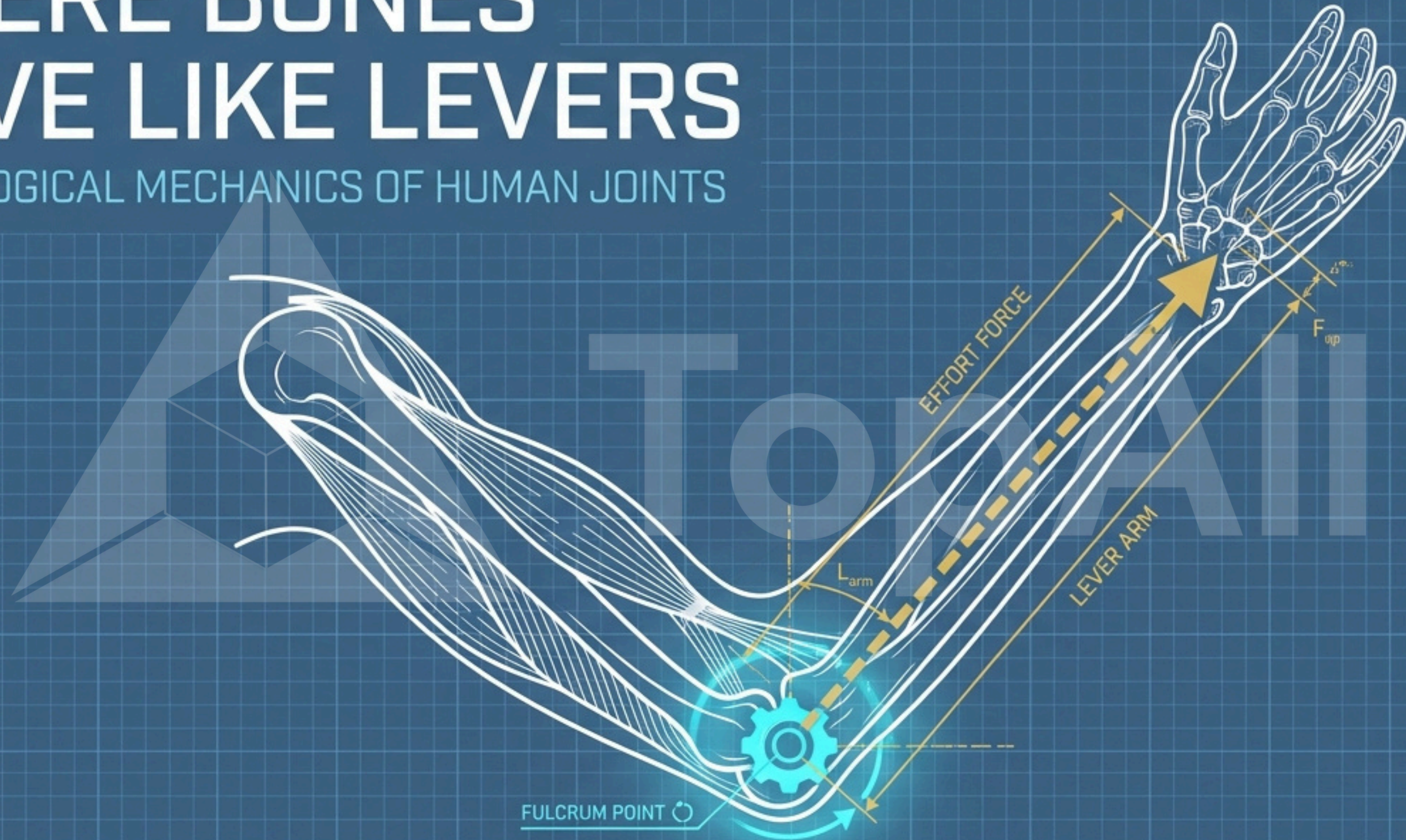


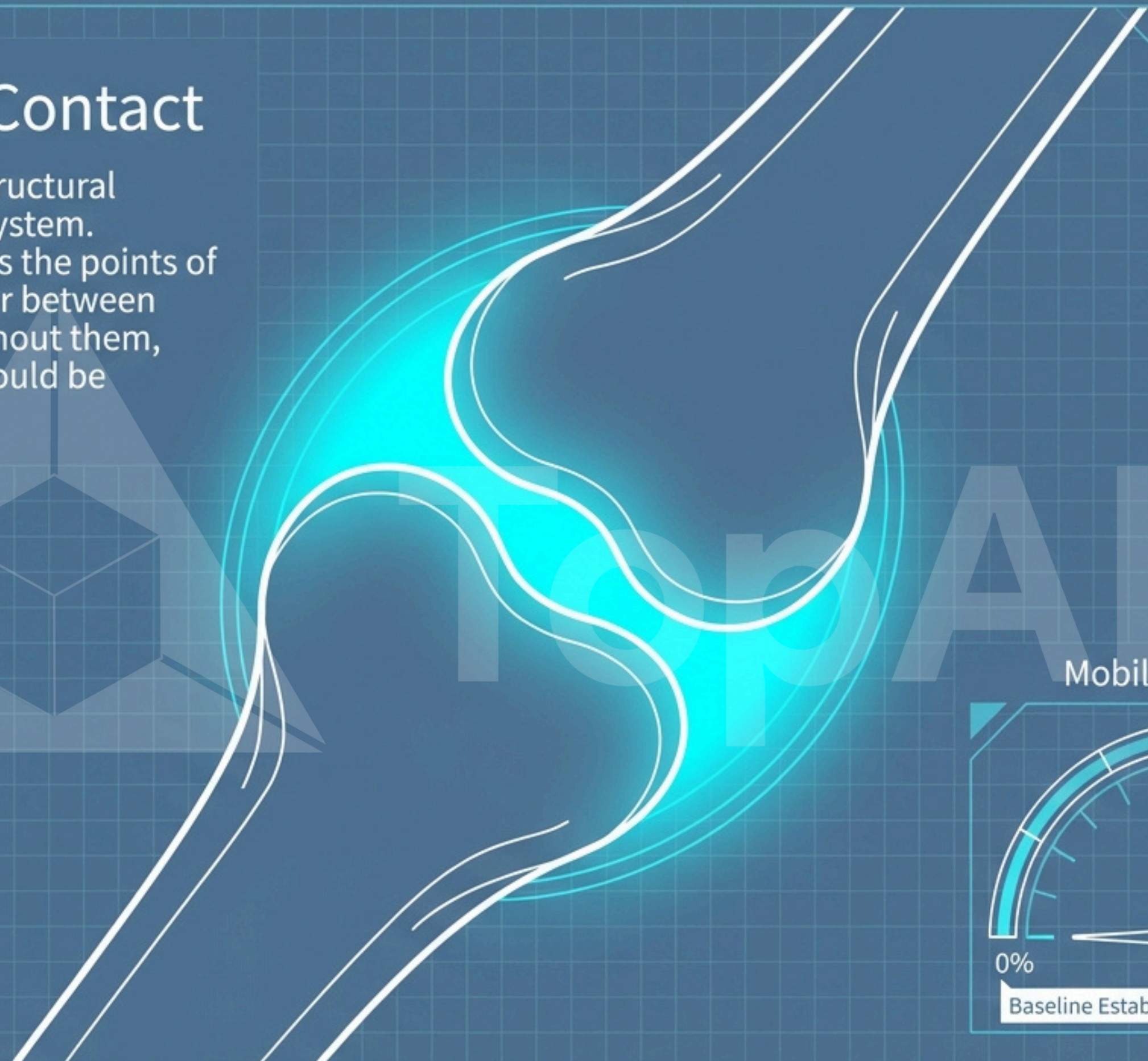
WHERE BONES MOVE LIKE LEVERS

THE BIOLOGICAL MECHANICS OF HUMAN JOINTS



The Points of Contact

Joints are the essential structural junctions in the skeletal system. They are defined simply as the points of contact between bones, or between bones and cartilages. Without them, locomotory movement would be impossible.



Mobility Spectrum



The Joint as a Fulcrum

Muscles alone cannot push; they can only pull. To create complex movement, the body uses the force generated by muscles to pull against bones, utilizing the joint as a mechanical fulcrum.



FULCRUM

EFFORT

LOAD

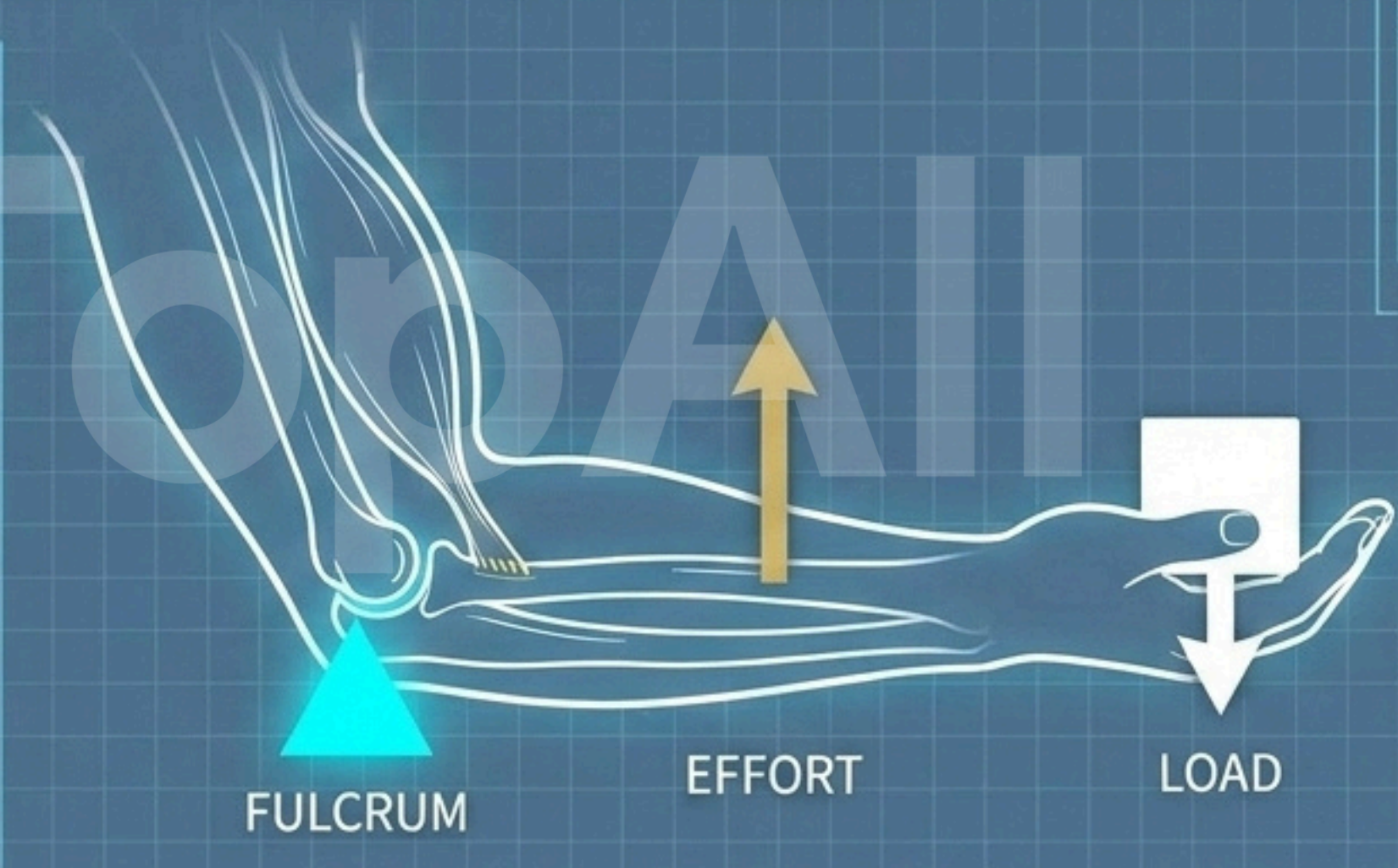
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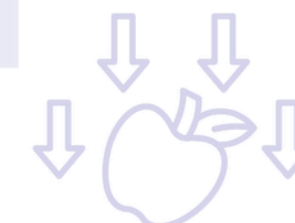
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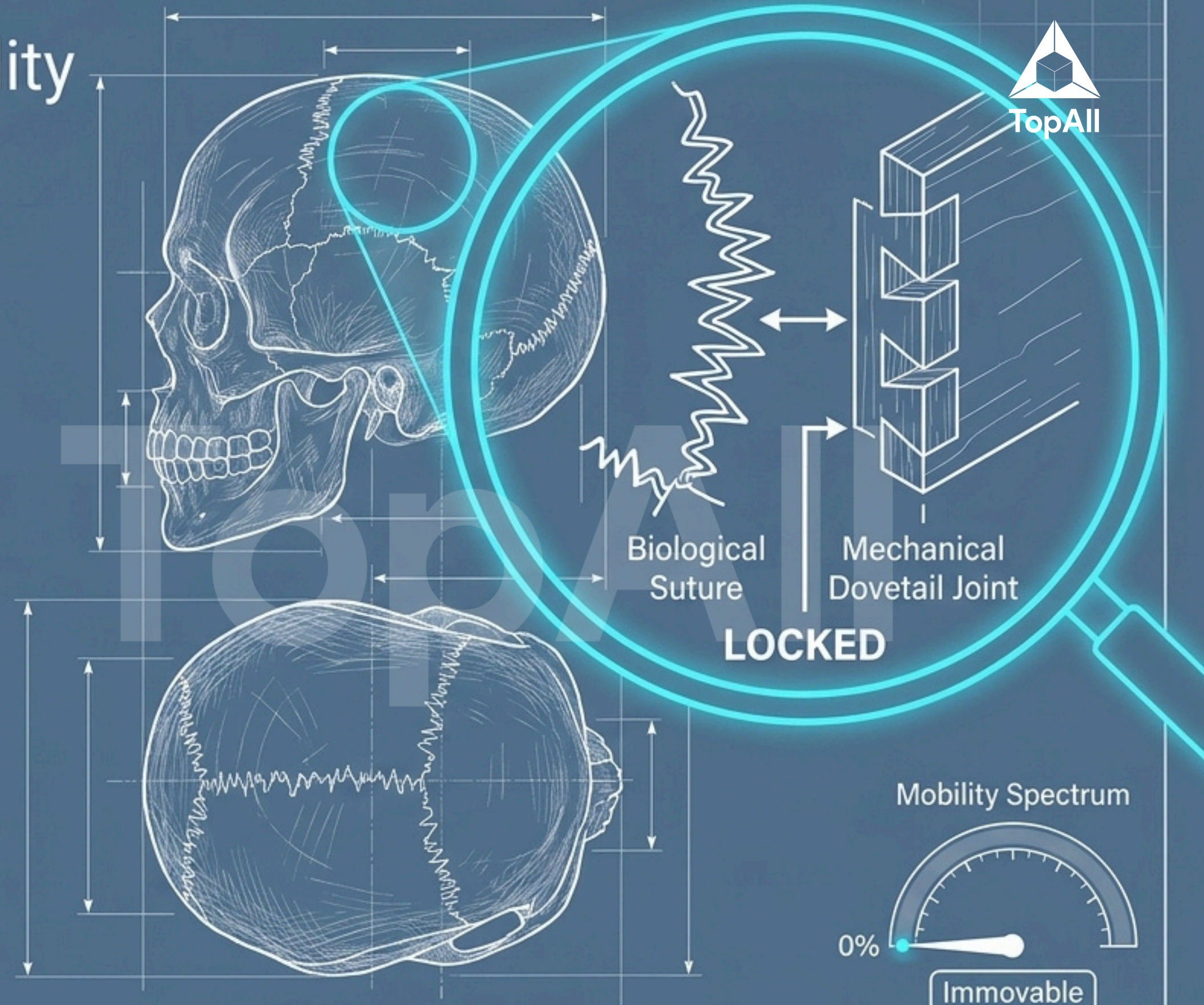


The Architecture of Stability

Fibrous Joints

Some joints are designed specifically to prevent motion. Fibrous joints allow zero movement, utilizing dense fibrous connective tissues to lock skeletal elements together.

Example: The flat bones of the human skull fuse end-to-end to form the cranium, connected by rigid seams called sutures.

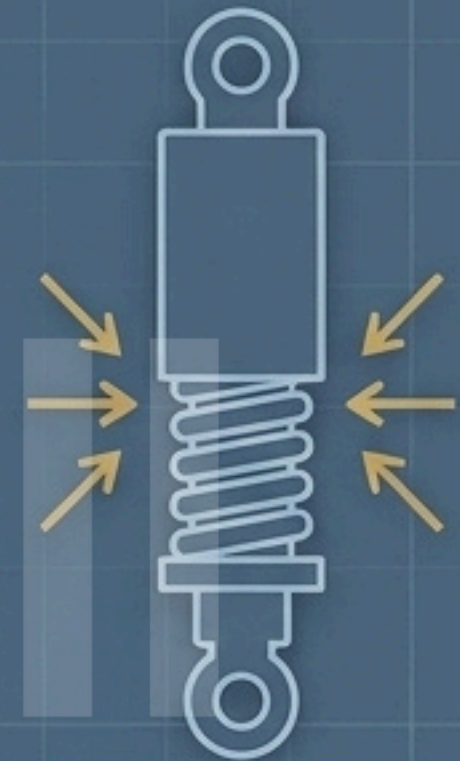


The Architecture of Flex Cartilaginous Joints



When bones are joined directly by cartilage, they form cartilaginous joints. This structure permits limited, controlled movements while absorbing significant compressive forces.

Example: The adjacent vertebrae in the vertebral column rely on these joints to allow the spine to bend and twist without snapping.



Mobility Spectrum



The Architecture of Action

Synovial Joints



The key to considerable, free movement is fluid separation.

Synovial joints are characterised by a distinct, fluid-filled synovial cavity sitting between the articulating surfaces of two bones, heavily reducing friction during locomotion.



A Catalog of Locomotion

Synovial joints take on highly specific mechanical forms to facilitate different axes of movement.



Ball-and-Socket
(Pectoral Girdle)



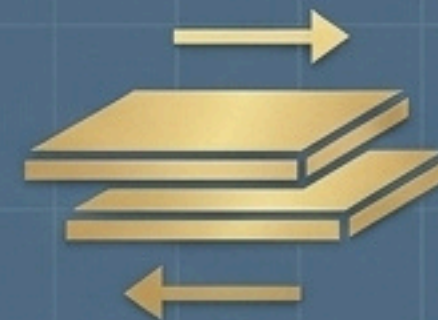
Hinge
(Knee Joint)



Pivot
(Atlas and Axis)



Gliding
(Between Carpals)



Saddle
(Thumb Carpals)



Form Dictated by Function

The human skeleton is a highly adapted mechanical system. The physical demand for movement strictly dictates the structural engineering of every joint.



0%

Fibrous Joints

Key Function: Protection



50%

Cartilaginous Joints

Key Function: Support & Flex



100%

Synovial Joints

Key Function: Locomotion



The Spectrum of Mobility



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