For the first time since it started functioning, the gravitational wave observatories at LIGO scientific collaboration have detected a merger of two unequal-mass black holes. The event, dubbed GW190412, was detected nearly a year ago, and this is almost five years after the first ever detection of gravitational wave signals by these powerful detectors.

Violent merger showed that it involved two black holes of unequal masses coalescing, one of which was some 30 times the mass of the Sun and the other which had a mass nearly 8 times the solar mass.

The actual merger took place at a distance of 2.5 billion light years away.

What is the uniqueness of the merger of unequal black holes:

- The detected signal’s waveform has special extra features in it when it corresponds to the merger of two unequal-sized black holes as compared with a merger of equal-sized black holes.
- These features make it possible to infer many more things about the characters in this celestial drama, namely, a more accurate determination of the distance from the event, the spin or angular momentum of the more massive black hole and the orientation of the whole event with respect to viewers on Earth.
- While the mass of the black hole bends the space-time close to it, the spin or angular momentum of this inscrutable object drags the nearby space-time, causing it to swirl around, along with it.
- Hence both these properties are important to estimate.

Crucial difference:

- Dominant emission of gravitational waves happens at twice the orbital frequency of the binary.
- In this case, we find, for the first time, emission at a frequency that is three times the orbital frequency. This emission is negligible when binaries contain equal masses and when the orbit is face-on.
- The asymmetry in the masses made the feeble higher harmonic component better ‘heard’, leading to its unambiguous detection.
- Also, in the case of the merger of unequal black holes, the spin of the more massive black hole can be determined from the extra features in the signal waveform.
- The spin of the heavier black hole plays a more prominent role in the dynamics of the binary. Hence, it leaves a stronger imprint on the waveform, making it easy to measure.