Tilt Classifications in Perfect Fluid Cosmology BRYANT WARD,
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COLLABORATION — We classify all known perfect fluid cosmological solutions
of the Einstein equations according to whether they are "tilted" or "non-tilted". A
non-tilted universe will have observers who see a homogeneous, isotropic universe
with matter at rest with respect to them. A tilted universe will have observers who
see matter moving relative to them. These classifications are useful when consider-
ing fluid models of the Universe in that the Hubble parameter and expansion are
observer dependent and can be different in a tilted versus a non-tilted Universe.
This gives more insight when fitting these models with observations of our real uni-
verse. We make these tilt classifications by establishing whether the 4-velocity of
each model's fluid is aligned with the normal of the hyper-surfaces of homogeneity
spanned by the Killing vectors for the space-time, which we obtain for each solution.
These computations are performed using the Differential Geometry software package
being developed at Utah State University. We incorporate the Killing vector fields
and the tilt classification into a library of solutions to Einstein's Field Equations as
part of the package, providing users with access to the solutions and their physical
and geometric properties.

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