## Subject Index

Bayesian Information Criterion (BIC), 26	dimensionless, 25, 41, 121, 125
clustering, 5, 9, 21, 22, 24, 26–29, 36, 58, 59, 65, 67, 68, 86–88, 90, 98, 127, 128 density-based, 90	curvelet(s), 10, 11, 13 coefficients, 11 transform, 10–13, 31, 42, 43, 85, 90
fuzzy c-means, 90	Direct Numerical Simulation(s) (DNS), vii, 1, 5,
K-means, 23, 90	7, 44, 61, 85, 86
learning-based, 21	database, 9, 30, 44, 86
parameters, 40, 58	grid-resolution criterion, 86
partitional, 23	disproportionate allocation, $58, 65, 127, 128$
pre-clustering, 22, 65	dissipation, vii, $2-7$ , 9, 44, 45, 57, 60, 61, 63, 70,
results, 36, 40, 58, 68, 86, 87	86, 92
spectral, 23	average rate, 45
Conditional Array Map (CAM), 71–73	average scale, 7
curvature(s), 19, 25, 80, 90, 124	dynamics, 42
Gaussian, 104–106, 120	geometry of structures, 44
mean, 105, 106, 120	governing equations, 92
normal, 16, 103, 104, 106	range dynamics, 2
principal, 15–17, 104–106, 119, 125	range of scales, vii
radius of, 16	rate of, vii
curvedness, vi, vii, 15, 16, 24, 25, 75, 106, 119,	scales, 7, 32
120	distance matrix, 21

enstrophy, vii, 5–7, 9, 44, 45, 60, 61, 63, 86	local scaling, 22
generation of, 93	affinity matrix, 22
geometry of structures, 44	normalized, 22
governing equations, 92	parameter, 22
maximum, 44, 86	Minimum Distance Man (MDM) 71-72
Euler	Animitani Distance Map (MDM), 11, 12
characteristic, 120	Navier–Stokes equations, 92
equations, 2	Navier-Stokes equations, 3
formula, 104	optimality score, 23, 25, 58, 59, 67, 68, 87
feature center, 20, 24, 122	passive scalar, vi, 5, 6, 9, 33, 36, 41, 42, 69
feature space, vi, 21–24, 36, 40, 58, 66, 86, 91	anisotropy, 42
frequency window, see window	fluctuation, 6, 30, 31, 37, 38, 42, 86, 91
Gauss' Theorema Egregium, 104	geometry of structures, 30
Gauss-Bonnet theorem, 120	iso-contours, 35
genus, 120, 121	plane cuts, 31, 32
grid resolution criterion, 7, 44, 45, 57	spectrum, 36
HSB (Hue-Saturation-Brilliance color space), 76	volume-data pdfs, 32
	governing equation, 6
intermittency, 7, 8, 45, 47, 57, 60, 61, 84	mixing, 42
K-means, <i>see</i> clustering	Poisson's equation, 63
Kelvin–Helmoltz	ramp–cliff structures, 42
wave clouds, 1	rotation-rate (tensor), 8, 45, 92, 93
Kelvin-Helmoltz	
instability, 8	Schmidt number, 30
Kolmogorov length scale, 7, 30, 33, 45, 57, 61, 87	shape index, vi, 15, 16, 24, 25, 106, 119, 120, 125 range of, 17, 108
Large Eddy Simulation(s) (LES), 2	signature (geometrical), vi, 2, 19–21, 36, 75

contracted, 21	interaction, 60
silhouette coefficient, 25–27, 36, 40, 58, 59, 66,	roll-up, 8, 70
67	stretching, 7, 94
spectral, 26	tube(s), 3, 43, 63, 84
clustering, 23	Burgers, 3
differentiation, 89	coalescence and reconnection, 8
Fourier-Galerkin method, 30	core, 62, 70
strain-rate (tensor), 4, 6–8, 45, 92	formation, 8, 43, 60, 70
compressional eigenvalue, 8	identification/eduction, 3, 9, 62, 63, 65, 70
intermediate eigenvalue/vector, $3, 8, 60$	vorticity, 41, 42, 45, 63, 70, 93
trace, 8	alignment, 3, 4, 8, 60
stratified random sampling, $58, 59, 65, 127$	coherent, 41
stretched spiral vortex, 43, 56, 60	compressive straining, 8
stretching parameter, vi, 20, 121	generation of, 93
subgrid-scale models, 2	governing equation, 92
Taylor Reynolds number, 30, 44, 45	incoherent, 41
	intense, 2, 4
upper and lower distances, $20, 24, 25, 122$	sheet, 60
visualization space, 23–25, 27–29, 34, 36, 39, 50–	wavelet(s), 10, 11, 41
59,65,67,86,88	transform, 2, 5
vortex	window (frequency)
sheet(s), 63, 84	angular, 11–13
curved, 3	radial, 11
flat, 3	low-pass filter, 11, 96
formation, 43, 60	top-hat filter, 10, 32
identification/eduction, 3, 62, 63	worms, 1, 2, 60, 87
instabilities, 60	