

Program for credit on Cubic Splines in Statistics, 2015

1. Theorem: powers and truncated cubic powers form a basis in the space of cubic splines.
2. Diagonally dominant matrix is nonsingular.
3. **Representation of Hermitian spline through its values and derivatives.**
4. Necessary and sufficient condition for Hermitian spline to be C^2 smooth spline.
5. Existence and uniqueness of interpolational spline with boundary conditions of the 1st type.
6. Existence and uniqueness of interpolational spline with boundary conditions of the 3rd type.
7. **Uniform approximation of continuous function by interpolational splines.**
8. Uniform approximation of a function from W_{∞}^1 by interpolational splines.
9. **Local properties of interpolational splines.**
10. Representation of divided difference as a linear combination.
11. **Difference between $g(x)$ and Lagrange polynomial. Representation of divided difference via derivative of higher order.**
12. Two representations of B-splines.
13. **Recurrence relation for B-splines.**
14. Theorem about the support of B-spline: where it is positive and where it equals 0.
15. **Integral of B-spline.**
16. **Lemma: spline cannot jump through n intervals.**
17. B-splines are linearly independent on R .
18. **B-splines form a basis in the space of splines on $[a, b]$.**
19. Minimal property of support of B-splines.
20. **Expansion of power function through normalized B-splines.**
21. Fundamental splines.
22. Existence and uniqueness of interpolational spline with boundary conditions of the 2nd type.
23. Schoenberg Theorem about extreme properties of splines.
24. Gershgorin Circle Theorem.
25. Theorem about smoothing splines: necessary conditions for minimum point.
26. **Theorem about smoothing splines: sufficiency of the conditions to provide a minimum point.**
27. **Theorem about smoothing splines: existence and uniqueness of a spline satisfying necessary conditions.**
28. Choice of weighting factors to construct a smoothing spline.
29. **Theorem about uniqueness of approximating spline.**
30. Algorithm for constructing approximating spline.
31. Statistical procedures in spline regression model: confidence interval and confidence strip.
32. Statistical procedures in spline regression model: testing hypothesis on structural change.
33. Local splines that are exact on cubic polynomials.