

Course
“Wavelet analysis and signal processing”
(lecturer Professor Galina F. Malykhina)

References:

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Mallat, S., *A wavelet tour of signal processing*, San Diego (CA) Academic Press, 1999
 2. Chui, C.K., *An introduction to wavelets*, Boston (MA), Academic Press, 1992
 3. Hernandez E., Weiss G., *A Course on Wavelets*, CRC Press, Boca Raton, 1996, 189 p.
- 1. The review of signal analysis in the time and frequency domains based on the classic and Short-time Fourier Transformation, Gabor expansion and wavelets. The time and frequency resolution and Heisenberg principle of uncertainty. Classification of wavelets. The approach to wavelet decomposition and reconstruction of signal. Multi-scale analysis. Dual wavelet basis.**
1. Hess–Nielsen, N., Vickerhauser M.V. Wavelets and Time–Frequency Analysis // Proceedings of IEEE, 1996, v. 84, p. 4
 2. Cohen, L., Time-Frequency Distribution // Proceedings of IEEE. 1989, v. 77, n 7, p. 941 – 952
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 6. Morris, J.M., Lu, Y., Generalized Gabor Expansion of Discrete-Time Signal via Biorthogonal–like Sequences // IEEE Transactions on Signal Processing, 1996, v. 44, n. 5, p.1378
 7. Zibulski, M., Zeevi, Y.Y., Frame Analysis of Discrete Gabor Scheme // IEEE Transactions on Signal Processing, 1994, v. 42, n 4, p. 942 – 945
- 2. The Banach and Hilbert functional spaces. The Fourier transformation of functions from $L_1(\mathbb{R})$ and $L_2(\mathbb{R})$. Fourier series and formula of Poisson. Short time Fourier transformation, Gabor expansion and Heisenberg principle of uncertainty. The Wigner – Wille distribution and interference phenomenon. Ambiguity function.**
1. Pei, S.-Ch., Yeh, M.-H., An Introduction to Discrete Finite Frames // IEEE Signal Processing Magazine, 1997, n.1, p. 84
 2. Grochenigchenig, K., Acceleration of Frame Algorithm // IEEE Transactions on Signal Processing, 1993, v.41, n.12
 3. Lawton, W., Tight frames of compactly supported wavelets // J. Math. Physics, 1990, v.31, p. 1898 – 1901
 4. Chui, Charles K., *An introduction to wavelets*, Boston (MA), Academic Press, 1992
 5. Daubechies, Ingrid, *Ten lectures on wavelets*, Philadelphia (PA) SIAM, 1992
- 3. Continuous wavelet-transform. Two-dimensional wavelets. Wavelet decomposition and reconstruction. Wavelet series. Bases and frames, stability conditions, basis of Riesz, R-wavelets. Orthogonal, semi-orthogonal wavelets and dual wavelet functions.**
1. Daubechies, Ingrid, *Ten lectures on wavelets*, Philadelphia (PA) SIAM, 1992
 2. Mallat, Stephane, *A wavelet tour of signal processing*, San Diego (CA), Academic Press, 1999
 3. Chui, Charles K. *An introduction to wavelets*, Boston (MA), Academic Press, 1992

4. **Basis spline analyses and spline space. The B-spline properties. Two-scale equation for the B-splines. Interpolational algorithm and B-nets for the function interpolation. Spline approximation and spline interpolation.**
 1. Chui, Charles K. *An introduction to wavelets*, Boston (MA), Academic Press, 1992
5. **Scale-function and wavelets. Multi-scale analyzes. Scale-function with finite two-scale relationship. Wavelet decomposition and reconstruction. Linearly-phase wavelet filters. Compact support wavelets. Wavelets of Shannon, Maier, Battl-Lemarier.**
 1. Mallat, S., *A wavelet tour of signal processing*, San Diego (CA), Academic Press, 1999
 2. Chui, C. K., *An introduction to wavelets*, Boston (MA), Academic Press, 1992
 3. Jawerth, B., Sweldens, W., *Wavelet-Based Multiresolution Analysis // SIAM Review*. 1994. v. 36, n 3, p. 377–401
6. **Basis spline-wavelets. Interpolar spline-wavelets. Spline wavelets with compact support. Spline wavelets and interpolar spline wavelets. Spline wavelets with compact support. The base wavelet calculation.**
 1. Hernandez, E., Weiss, G., *A Course on Wavelets*, CRC Press, Boca Raton, 1996, 189 p.
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7. **Orthogonal and biorthogonal wavelet-bases. Wavelets and filter bank. Daubechies wavelet with compact support.**
 1. Daubechies, I., *Ten lectures on wavelets*, Philadelphia (PA) SIAM, 1992
8. **Wavelet packets. Tree of wavelet packets. Time-frequency localization. Filter banks for wavelet packet. Wavelet packet for images.**
 1. Wickerhauser, M.V., *Acoustic signal compression with wavelet packets.* / C.K. Chui, editor, *Wavelets in Theory and Applications*, NY, Academic Press, 1992
 2. Coifman, R.R., Wickerhauser, M.V., *Entropy-based algorithms for best basis selection // IEEE Transactions on Information Theory*, 1992, 38(2), p. 713 – 718
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9. **Application of wavelet analyses. Wavelet filtering. Signal and image coding. Compression of signals, images and video.**
 1. Teolis, A., Benedetto, J., *Local frames and noise reduction // Signal Processing*, 1995, v. 45, p. 369 - 387
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 4. Averbuch, A., Lazar, D., *Image compression using wavelet decomposition // IEEE Trans. Image Processing*, 1996, v. 5, n. 1, p. 4 – 15
 5. Unser, M., *Texture classification and segmentation using wavelet frames // IEEE Trans. Image Processing*, 1995, v. 4, n. 11, p. 1549 – 1560
 6. Donoho, D., Johnstone, I., *Adapting to unknown smoothness via wavelet shrinkage // Journal of American Statistics Association*, 1995, v. 90, p. 1200 - 1224