La función de pérdida es de suma importancia cuando se desea imputar valores en series temporales (Balcilar et al., 2017; Gupta & Lam, 1996; Terven et al., 2023).

Otra característica importante es aprovechar la asociación temporal generada por el mecanismo propio (Smaragdis et al., 2011; Wibawa et al., 2022)

Existe una gran variedad de fuentes de información (Bastar, 2012; Lerma González, 2009)

(Bahdanau et al., 2014; Benidis et al., 2022; Elharrouss et al., 2025; Mojtahedi et al., 2025; Sutskever et al., 2014; Terven et al., 2023)

- Bahdanau, D., Cho, K. H., & Bengio, Y. (2014). Neural Machine Translation by Jointly Learning to Align and Translate. *3rd International Conference on Learning Representations, ICLR 2015 Conference Track Proceedings*. https://arxiv.org/pdf/1409.0473
- Balcilar, M., Bouri, E., Gupta, R., & Roubaud, D. (2017). Can volume predict Bitcoin returns and volatility? A quantiles-based approach. *Economic Modelling*, 64, 74–81. https://doi.org/10.1016/J.ECONMOD.2017.03.019
- Bastar, S. G. (2012). Metodología de la investigación (1a ed.). Red Tercer Milenio.
- Benidis, K., Rangapuram, S. S., Flunkert, V., Wang, Y., Maddix, D., Turkmen, C., Gasthaus, J., Bohlke-Schneider, M., Salinas, D., Stella, L., Aubet, F. X., Callot, L., & Januschowski, T. (2022). Deep Learning for Time Series Forecasting: Tutorial and Literature Survey. *ACM Computing Surveys*, 55(6). https://doi.org/10.1145/3533382
- Elharrouss, O., Mahmood, Y., Bechqito, Y., Serhani, M. A., Badidi, E., Riffi, J., & Tairi, H. (2025). Loss Functions in Deep Learning: A Comprehensive Review. http://arxiv.org/abs/2504.04242
- Gupta, A., & Lam, M. S. (1996). Estimating Missing Values Using Neural Networks. *Journal of the Operational Research Society*, *47*(2), 229–238. https://doi.org/10.1057/jors.1996.21

- Lerma González, H. D. (2009). *Metodología de la investigación: propuesta, anteproyecto y proyecto* (4a ed.). Ecoe Ediciones.
- Mojtahedi, F. F., Yousefpour, N., Chow, S. H., & Cassidy, M. (2025). Deep Learning for Time Series Forecasting: Review and Applications in Geotechnics and Geosciences. *Archives of Computational Methods in Engineering 2025*, 1–31. https://doi.org/10.1007/S11831-025-10244-5
- Smaragdis, P., Raj, B., & Shashanka, M. (2011). Missing Data Imputation for Time-Frequency Representations of Audio Signals. *J Sign Process Syst*, *65*, 361–370. https://doi.org/10.1007/s11265-010-0512-7
- Sutskever, I., Vinyals, O., & Le, Q. V. (2014). Sequence to Sequence Learning with Neural Networks. *Advances in Neural Information Processing Systems*, *4*(January), 3104–3112. https://arxiv.org/pdf/1409.3215
- Terven, J. R., Cordova-Esparza, D. M., Ramirez-Pedraza, A., Chavez-Urbiola Cicata-Qro, E. A., Politecnico, I., & Mexico, N. (2023). LOSS FUNCTIONS AND METRICS IN DEEP LEARNING. A REVIEW UNDER REVIEW IN COMPUTER SCIENCE REVIEW.
- Wibawa, A. P., Utama, A. B. P., Elmunsyah, H., Pujianto, U., Dwiyanto, F. A., & Hernandez, L. (2022). Time-series analysis with smoothed Convolutional Neural Network. *Journal of Big Data*, 9(1). https://doi.org/10.1186/s40537-022-00599-y