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★ **A posteriori error analysis via duality theory.**

With applications in modeling and numerical approximations.

Advances in Mechanics and Mathematics, 8.

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A posteriori error analysis of discretisation of PDEs has become a hot research topic for the last decade, and several books have already been devoted to it. It is important for many approximation procedures at either continuous or discrete levels. In applications many physical models are approximated by linearizations, and it is important to know a posteriori error estimates for the approximation so that approximated errors can be estimated explicitly. Therefore it is very useful to have a general framework within which a posteriori error analysis can be carried out either at continuous or discrete levels for a wide range of practical problems.

In this aspect, the duality theory in convex analysis seems to offer such a common base on which a posteriori error estimates can be derived for many important practical problems, although it may not be straightforward to apply this approach to non-convex or evolutionary problems. It seems that much more research is still needed in this area. I believe that this book is the first book to present a systematical study in applying the duality theory to deriving a posteriori error estimates for a variety of interesting problems. It has six chapters: The first two provide necessary introductions to functional analysis, PDE theory and convex analysis. Then a posteriori error analysis is carried out for idealizations in linear problems in Chapter 3, and for linearizations in Chapter 4. Then a posteriori error estimates are examined for some numerical procedures (e.g., Kačanov iteration method) at continuous level in Chapter 5. The last chapter deals with variational inequalities of the second kind.

The book is very well written. With some basic mathematical prerequisites, this nice book is quite easy to follow. I believe that the book will be very useful for researchers and graduate students in applied and computational mathematics and engineering.

Reviewed by *Wen Bin Liu*